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- Mechanical Keyboards Tried And Tested
- How To Deal With Ransomware
- Can You Really Make Your PC Completely Wireless?

VIRTUAL REALITY IN YOUR HOME?

THE TECHNOLOGY ARRIVING LATER THIS YEAR

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50 Mechanical Keyboards

Although there are plenty of good keyboards based on membrane technology, if you want the very best typing experience, then a mechanical design is what you need. They're also pretty good for gaming too. They're not always cheap, however, so if you're going to get buy one, you want to make sure you get the right one first time. Hopefully, this week's group test will help make sure you do

58 The Totally Wireless PC

If you're anything like us, the area around your PC will look like someone spilled a pan of black, plastic spaghetti all over the place. Yes, no matter how hard you try, there always seem to be cables that need tidying up. But can you get rid of them entirely and still use your computer? We've been finding out

62 Pi Laptop

The Raspberry Pi is a fully functional computer, capable of displaying full HD video, but it's not the most convenient device in the world. if you want to use it as a dedicated PC, there are ways to turn it into a laptop or a desktop system, though, as David Briddock explains

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Virtual Reality

How it's (possibly) coming to your PC

VR has been heralded as the must-have tech for 2016, and now it's finally here

I n September 2014, at the Dice Europe event that took place within the plush Royal Garden Hotel in London, there was something of a buzz surrounding a new peripheral unveiled by Sony a few months earlier. Called Project Morpheus, it hooked into a PlayStation 4 console and fitted over the head of the user. The headset contained a screen, and it eliminated any exterior visual stimulus. When it was activated, it seared the eyes with a game called *Street Luge* and proved to be a fully immersive slice of entertainment.

As the delegates were busily tucking into their food, the area around this headset had suddenly become vacant, and I spied my chance to give it a go. Laying down on a bean bag, the headset was snugly yet comfortably fitted around my head, and the game was activated. It involved steering a board on which a virtual me was placed as it terrifyingly zoomed down the road. By tilting my head left or right, the direction would change without any need for a controller. It was at once terrifying and exhilarating as my brain was fooled into thinking the cars and fallen rocks really were a danger.

❝ I was startled to be suddenly lying on the floor as people gawped and networked ❞

All the while, it felt as if I had suddenly been transported out of the room. I was making very obvious movements to avoid a collision, oblivious to how it would appear to any would-be watchers. And lo-and-behold, there was a crowd. Unbeknown to me, the delegates were fast eaters and they soon gathered around. When the helmet was pulled off, I was startled to be suddenly lying on the floor as people gawped and networked. But it didn't matter. It was another chance to experience virtual reality and an opportunity to try what is now known as PlayStation VR.
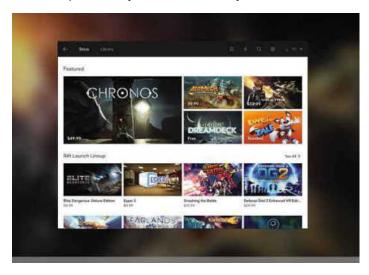
I say 'another' because a year earlier, I had also had the fortune of trying the Oculus Rift, which had been showcased at 2012's E3 to a very receptive audience. In this case, I was able to sit down and experience a virtual drop-tower themepark ride. It felt so real that I could feel myself becoming anxious about the inevitable rise from the ground, and my palms began to sweat. Sure, there were noticeable pixels and the graphics were game-like, but there's no accounting for the tricks the brain can pull on you in such a situation. And it got me very excited indeed about the prospect of VR.

It would appear I'm not the only one. At the Gadget Show Live at the NEC in Birmingham a couple of weeks ago, the queues to try VR – in particular HTC Vive, which we'll come to later – were huge, particularly on the Saturday. By 2pm, the organisers were turning people away for the day, having already tried to introduce a booking system of sorts. Such is the desire to see what the fuss is all about, people were even willing to don older Oculus Rift prototypes in order to watch a VR advert for Hive's thermostats. Little wonder VR was voted the best-loved tech at the show.

Next-gen VR

All of this will be good news for Palmer Luckey, the brain behind the Oculus Rift. For PC users, his VR tech is arguably the most exciting (and affordable), and it has finally been released following years of development. The first people to receive headsets at the end of March were those who pledged money for a development kit on Oculus's Kickstarter page. A total of 9,522 backers had come forward, handing over some $2,437,429. They received a free Kickstarter Edition Oculus Rift on top of the development kit they had already received and, like all Rift pre-orderers, they also got bundled copies of *Lucky's Tale* and *EVE: Valkyrie*.

PlayStation VR

Virtual Deja Vu?

The concept of virtual reality is not actually new. In 1960, cinematographer Morton Heilig drew audiences into his stories using a Sensorama, which combined a stereoscopic display, odour emitters, fans, speakers and a moving chair. A year later, the Headsight was invented, which included the use of a helmet: when the user's head turned, the camera angle was adjusted. The technology was adapted so helicopter pilots could wear helmets that would allow them to see via cameras on the bottom of their choppers.

Developments continued, adding depth perception, for instance, and eventually it well and truly caught the public's imagination. *Red Dwarf* fans will recall the 1988 episode 'Better than Life', which introduced a machine that allowed the crew to submerge themselves in a virtual reality world by inserting electrodes into their frontal lobes. But they'll also remember the Virtual Boy – Nintendo's stab at making VR a mass-market home console product. The problem was that graphics and processing power back then were too poor and slow for VR to be anything other than a disappointment.

By the end of the 1990s, VR became the preserve of serious applications. It remained in use by CAD designers, allowing them to see the creations they were working on, touching them and testing them for their real-life possibilities and restrictions. It also became useful in academia. There was a case of scientists at Barcelona University using VR for an experiment that placed the minds of 24 men into the body of a virtual woman, for instance.

Some of the men saw the world through the eyes of a woman sitting down, noting that they had a female figure and clothes, while the others were situated just to the side of the virtual woman. In each case, it changed the way they felt about themselves. "This work opens up another avenue for virtual reality, which is not just to transform your sense of place, but also your sense of self," summed up Mel Slater, a virtual reality researcher at the Catalan Institute of Research and Advanced Studies and University College London.

Researchers also recreated out-of-body experiences, handing volunteers goggles containing video screens for each eye. Behind the volunteers was a camera, which fed images to the goggles. People were able to see a 3D image of their own back and, in doing so, it allowed scientists to make further studies into brain function. Sometimes when the brain has been damaged through a stroke, epilepsy or drug abuse, such out-of-body experiences can be felt, and the study allowed exploration of this. Such experiments will undoubtedly be of use to games designers in this new wave of VR enthusiasm.

Impressions so far are favourable. The Rift boasts an OLED display with 1080p per eye, a 90Hz refresh rate and a 110-degree field of view (the human eye can see at up to 180 degrees). It also has come on in leaps and bounds from the early prototypes, and it's now not only more comfortable to wear thanks to three adjustable Velcro straps and a relatively light casing, but less likely to induce motion sickness too. My first go on the Oculus Rift had actually left me disappointedly queasy, but a lot of work has gone into curing that symptom, allowing players to don the headset for many hours on end without too many problems.

It is, of course, difficult to produce virtual reality headsets that suit everyone, since we all have different faces, head shapes and eyesight. Oculus has spent a lot of its time working on a system that will be suitable for as many people as possible, and it appears to have cracked it. But while it's great for the human race's eclectic array of visages, it does require a certain type of computer in order for it to work: a thunderously powerful one. The Rift relies entirely on the processing power of a PC, and it's recommended that you have at least an Nvidia GTX 970/AMD R9 290 video card, an Intel i5-4590 CPU, more than 8GB of RAM, three USB ports, a compatible HDMI 1.3 video output and at least Windows 7. You can buy Oculus-ready PCs, but that's obviously going to considerably increase the cost of buying into this new tech.

As it is, the Rift is costing £499, not including the shipping costs. For that you get an Xbox One controller, an Oculus remote and, of course, the headset, which has the headphones built in. It

HTC Vive

also comes with a camera sensor, which connects to the PC and tracks the position of your head by picking up on a set of infrared LEDs on the front of the headset. On top of that, you have access to the Oculus Store, which has videos and games available, Yet Oculus's touch controllers – which look like a PlayStation controller chopped in half and banded to fit on to both hands – are being delayed. That's not strictly a bad thing, because gamers are saying that the Xbox One controller is more than good enough. Given that developers have been basing their Rift games on it for a few years, it also makes sense that the Xbox One controller is the primary device right now.

One thing you may have also noticed isn't mentioned is Mac support. On that score, things aren't looking too hot. Oculus suspended Mac development last year and said it would only resume work when Apple released a "good computer". It's also suspending Linux development, which is certainly a shot in the arm for Microsoft, and there seems to be nothing on the horizon that is set to cause a rethink.

Indeed, when ShackNews asked Luckey when he foresaw Mac support in March of this year, he answered, "It just boils down to the fact that Apple doesn't prioritise high-end GPUs. You can buy a

$6,000 Mac Pro with the top-of-the-line AMD FirePro D700, and it still doesn't match our recommended spec. If they prioritise higher-end GPUs like they used to for a while back in the day, we'd love to support Mac. But right now, there's just not a single machine out there that supports it. So even if we can support it on the software side, there's just no audience of people that can run the vast majority of software out there."

Early Adopters

It's likely that, at some stage, the Rift will work on a Mac (or Apple will bring out its own device and shut Oculus out of its system forever, which we could certainly see happening). After all, it's still early days for the new wave of virtual reality, and even Luckey confesses that the Rift is aimed at early adopters. One reviewer for the Wall Street Journal said it was the 2016 product you hope your neighbour buys, but that's because of the sheer expense of the product.

When you consider that just 1% of PC owners already have a machine capable of running the Rift right now, you can see just how limited a market the Rift could enjoy (even though 1% in a market as vast as the PC is still a sizeable number). But big things will happen, believe us. For a start, Oculus Rift is the virtual reality

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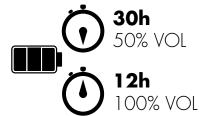
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Other Systems

Sulon Q
Unveiled at the GDC in San Francisco this year, Sulon Q brings together augmented reality, VR and spatial computing in one tether-free headset. It operates via a battery and requires no additional hardware (you can use a keyboard and mouse but also your hands). Packing an AMD FX-8800 running at 3.4GHz and with Windows 10, wi-fi, Bluetooth and 256GB of SSD storage, it's akin to being the very first stand-alone VR PC. It's definitely one to watch.

Samsung Gear VR
Launched in November 2015, the Samsung Gear VR uses a compatible Samsung Galaxy device paired with the Oculus app. It's similar in many ways to Google Cardboard in that the mobile becomes the screen and lends the processing power, while the Gear VR unit is the controller (albeit far more advanced than Cardboard). There are more than 185 apps available for the device, ranging from games to 360° photo viewing apps. You can also stream Netflix to the Gear VR. It's like having a personal cinema.

LG 360 VR
Not to be outdone, LG has a model of its own, although Gizmodo rather hilariously called it "one of the s****iest virtual reality headsets I've ever tried". We haven't given it a go ourselves, but it's designed for the LG G5 phone and, by all accounts, it's light (100g) but uncomfortable and inexpensive but cheap-feeling. The field of view is poor, but it does at least support YouTube 360 and Google Cardboard. It has a resolution of 960x720 for each eye.

Zeiss VR One
The Zeiss VR One can be picked up for a smidgen over £100, and it's impressive enough, coming with cutting-edge precision lenses and made so you can slip it over a pair of glasses. It supports Google Cardboard apps and makes use of your phone, which fits into a tray that you have to specify and buy up-front, and it has the quality of lens that you would expect from this company.

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system that Facebook acquired in 2014 for $2 billion, and it will surely want to see this in the hands of the mass market. Facebook certainly seems to have some big plans for it.

"After games, we're going to make Oculus a platform for many other experiences," said Facebook founder Mark Zuckerberg in a blog post. "Imagine enjoying a court side seat at a game, studying in a classroom of students and teachers all over the world or consulting with a doctor face-to-face – just by putting on goggles in your home." And yet the only problem for Zuckerberg is that he isn't the only person with an eye on VR for the future. As we've seen, Sony is also seeking to make inroads with the PlayStation VR (PSVR) and, of the emerging technologies, this one looks set to be the winner in the short term, if not only because it's looking to retail for a more wallet-friendly £349.

PlayStation VR
PSVR is compatible with the PlayStation 4, which puts it in reach of around 36 million gamers. One of the first things you notice is its stylish looks. While Oculus Rift remains rather functional in its aesthetics, Sony has made its offering appear futuristic, lending it even greater curiosity value. It's also well-backed, as you'd expect, with more than 230 studios said to be working on games for PSVR and more than 50 of those titles set to be due out by the end of the year. Sure, it doesn't quite match the specs of the Rift, but it will become the most affordable of the 'proper' VR headsets and will negate the need for a new megabucks PC.

What makes it interesting for PC owners is Sony's willingness to consider branching out and making PSVR potentially cross-platform. At first, it appeared that Sony's headset was only going to be compatible with the PS4, but news has emerged that the company is considering bringing the kit to the PC as well. "Since the PS4's

internal parts are similar to those of a PC, this is a possibility," said Sony Computer Entertainment executive vice president Masayasu Ito in an interview with Nikkei. He also said Sony hoped to shift two million PSVR headsets by Christmas – even though it only launches in October.
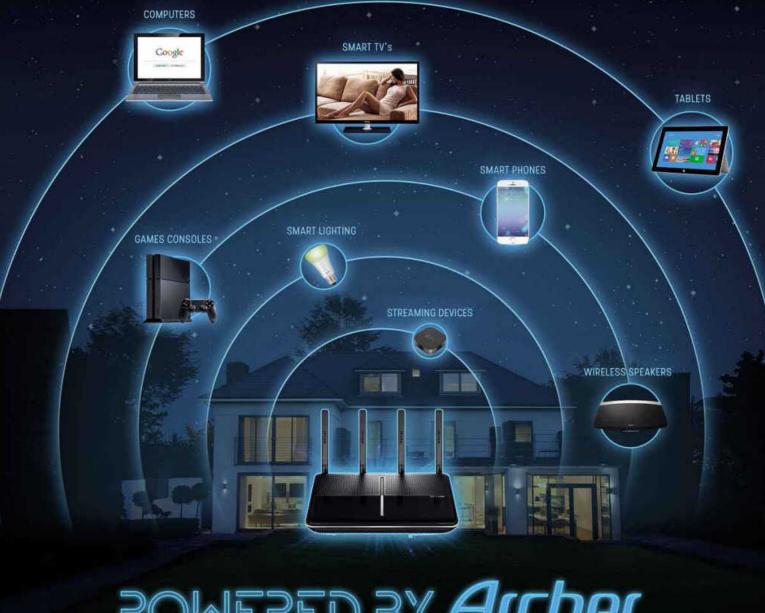
For that reason, PSVR becomes even more appetising – not that the specs aren't salivating enough. The headset will have a 5.7"

> ## 66 One of the first things you notice about PlayStation VR is its stylish looks 99

1080p OLED display with a 100° field of view and a 120Hz refresh rate. The curved lenses stretch across your field of vision, and the headset uses sensors so it knows where your head is pointing. There's still the problem of noticeable pixels, but with the PSVR this is more than compensated for by the lightweight construction, amazing microphone and the headset's ability to take a 'bog-standard' PS4 game and convert it. This makes it appear as if it's playing on a huge virtual cinema screen.

And yet all is not quite what it seems, because the price of £349 is a little misleading. Leaving aside the fact that you'll need to buy a PS4 if you don't already have one (they cost less than the peripheral, which will raise a few eyebrows), you have to fork out for a set of Move controllers (yes, they're back in use again) and a PlayStation Camera. There will be a bundle that has the entire

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kit, and that's going to come in at more than £420, we'd reckon. It means you'll be looking around a price of around £700 before you even start splashing out on games. That's still cheaper than the competitors, though, and while we wouldn't go as far to say it's a bargain, in this sector of the industry, we can see why some people are calling it that.

You may want to hang fire a little longer, though. There are rumours that Sony is going to enhance the PS4 with a PS4.5 to add 4K capabilities and, most likely, provide a boost in power that would ultimately benefit the PSVR. We'd also be interested to see what kind of PC Sony would pitch the headset at. We'd imagine it wouldn't need the same kind of power as the Oculus Rift, which would place Sony's device in a strong position. Tellingly, Sony is not considering PSVR as a peripheral, which makes it more likely that it will be usable on a variety of platforms – maybe even the Mac – at some stage.

HTC Vive

If you want to buy a VR set that's guaranteed to work with a PC, then you may want to weigh up the HTC Vive alongside the Oculus Rift. Unveiled just a year ago and released on 5th April, Vive has been turning many heads, even though snapping up this device will set you back an eye-watering £689. For that, though, you get what is arguably the most advanced system of them all.

Like Oculus Rift, Vive has a couple of screens with a resolution of 1080 x 1200, a refresh rate of 90Hz and a 110° field of view.

> **❝ Just 1% of PC owners have a machine capable of running the Rift ❞**

It's packed with 32 sensors that range from an accelerometer, laser position sensors and a MEMS gyroscope. To operate it, you use what are pretty much a couple of wireless modified Steam controllers spliced in half.

But there are some issues to consider. The HTC Vive not only requires hefty financial investment, it also needs you to be serious about integrating VR into your life, because it needs a lot of room in order to work. There's a reason why those playing with the HTC Vive at the Gadget Show Live this year had to do so inside special boxes: you'll have to clear some space if you want to make the most of this hardware. It can work over a range of 4.6 metres by 4.6 metres, and you certainly need at least 1.5 metres by 2 metres of play area.

It also needs some power. The recommendations are an Nvidia GeForce GTX 970/AMD Radeon R9 290 GPU equivalent or greater, an Intel i5-4590/AMD FX 8350 CPU equivalent or greater, more than 4GB RAM, HDMI 1.4 or DisplayPort 1.2 or newer, a USB 2.0 or greater port and at least Windows 7. One downside is that has to be connected with a three-way wire that trails out of the back and it's heavier than a Rift to wear.

Even so, it has some neat features. Powered by Steam VR, it includes something called Vive Phone Services, which lets you receive and respond to calls, get texts and check calender invites without taking off the headset. A front-facing camera lets you see the real world if you need to, and the device comes with interchangeable foam inserts and nose pads to adapt to your face (and over your glasses if you wear them). There's no doubt it's an

advanced piece of kit and very impressive, but it's very much at the higher end.

Despite that, it has a lot of support including Google but what is perhaps surprising is that the games are very different to what you'd expect. It comes with *Job Simulator: The 2050 Archives* by Owlchemy Labs, in which robots have replaced all human jobs, and you can learn what it was like to have a job. You also get *Fantastic Contraption*, letting you walk around a grassy island floating in the sky, build a machine the size of a horse with your own hands, and watch it roll out into the world. It sounds very experimental, but perhaps VR's true use will eventually emerge through such endeavours.

Google Cardboard

It certainly seems as if VR is still at the beginning and that companies are playing the field a little. As well as supporting HTC Vive, for instance, Google also has its own VR system called Google Cardboard and for those looking to experiment with VR, this is by far the best choice and the cheapest way of getting virtual reality up and running.

All of the necessary information is at **www.google.co.uk/get/ cardboard**, but essentially you can buy cardboard-based viewers for around £5 to £10, into which you insert your Android phone or iPhone. Screens of up to six inches are supported, and you all get the necessary bits including the lenses and a magnet to allow you to move the device around and see the virtual world on the screen in all its glory.

There are lots of compatible apps around. Android currently has the most, but the iPhone is set to play catch up, thanks to the Cardboard SDK being released for iOS at the tail-end of March. Cardboard in no way replicates the quality of the more expensive systems (and nor does it work directly with a PC), but it can allow you to work out whether an investment in a full system is worth the expense or whether the novelty value alone is more than enough for you.

It may also be worth just waiting if you're not fully committed. The big trend of recent times was 3D, but that appears to have fallen by the wayside, and while VR is exciting, there's no saying for sure that it will work out this time around. It has been and gone before, but the difference this time is that many more billions are being pumped in. Technology is catching up with expectations, and the possibilities are too vast to ignore. Very few would want to see it fail. **mm**

Ran$omware

What is it, and how can you fight it?

There's a very nasty type of computer attack out there, and it can cost you real money

Few PC users will run their system without an adequate form of protection against various kinds of attack. Anti-virus and firewall software is commonplace, and going online without this basic level of protection is seen by most as reckless. Why risk the loss of data or system instability when a simple program, many of which are free, could protect you? Makes sense, doesn't it? Of course it does, and the majority of users would agree.

What if, however, this diligence and focus on security was flawed? What if all your attempts to protect your system failed and you found yourself attack by a problem that had no fix? What if no amount of software could remedy it, and only by spending a good deal of cash could you get your PC and your data back? What would you do then?

Although you may have never heard of it, ransomware is just this kind of threat and is one of the most insidious attacks in the computing world today. Sadly, it's also a threat that seems to be growing year on year. This is a threat that can cause a whole truckload of misery as well as financial hardship in one

▲ *Probably the most famous ransomware attack, CryptoLocker was a major trheat before it was shut down*

Type Of Ransomware

Winlockers

This breed of ransomware doesn't actually encrypt any data. Instead it simply locks your PC and often displays a pop-up message from some form of law enforcement, including the FBI. There are many variants, but most will order a payment to be made in order to unlock the PC and provide directions on how to pay.

SMS

SMS ransomware is effectively exactly the same as Winlocker. The only real difference is the SMS code you're given in order to pay the ransom. Instead of providing details on payment, you simply have to text a premium number with the code supplied to have your system unlocked.

MBR

Similar in some respects to Winlocker ransomware, MBR ransomware instead locks the system at the Master Boot Record level by changing the MBR file, and it even stops Windows from loading entirely. Most will claim that this is done using encryption, but in truth, there's commonly no encryption used at all. People have managed to find affected files and have used MBR repair tools to bypass it. There are more nasty variants out there, though, so don't assume it'll be easy to get rid of it.

Encryption

More advanced than the system lockout ransomwares and the one that has caused the most trouble. Encryption ransomware is a trojan that can encrypt files on your system with a very strong encryption algorithm. The only way to recover data is with a key, provided by the attacker.

This kind of ransomware is the most serious, as it's usually impossible to remove unless security software vendors have cracked it. You'll be very glad you backed up your data if you ever find yourself attacked in this manner.

YOUR COMPUTER HAS BEEN LOCKED!

This operating system is locked due to the violation of the federal laws of the United States of America! (Article 1, Section 8, Clause 8; Article 202; Article 210 of the Criminal Code of U.S.A. provides for a deprivation of liberty for four to twelve years.)
Following violations were detected:
Your IP address was used to visit websites containing pornography, child pornography, zoophilia and child abuse. Your computer also contains video files with pornographic content, elements of violence and child pornography! Spam-messages with terrorist motives were also sent from your computer.
This computer lock is aimed to stop your illegal activity.

To unlock the computer you are obliged to pay a fine of $200.

You have **72 hours** to pay the fine, otherwise you will be **arrested**.

You must pay the fine through
To pay the fine, you should enter the digits resulting code, which is located on the back of your   in the payment form and press OK (if you have several codes, enter them one after the other and press OK).

OK

⌃ Some ransomware pop-ups are pretty convincing, such as this FBI warning

fell swoop. Worst of all, it's also a threat that, if you're unlucky enough to be attacked by it, may not even have a way out. Let us elaborate.

Digital Hostage

Ransomware is a system attack that's designed to extort money from targets, and it does this by holding the user's system ransom, hence the name. The attack, which can come in differing forms, usually assaults the user by locking their system out or encrypting their data with a very strong, nigh-on unbreakable level of encryption. The only way to get the data back is, you've guessed it, to pay a ransom. The attackers use encryption so strong that even cutting-edge law enforcement computer labs fail to break it, and in the past the likes of police departments and even the FBI have advised users to pay up. It's that bad.

During a meeting with of business and technology experts (via The Security Ledger - **bit.ly/1XopBiV**), the FBI's Assistant Special Agent in charge of the FBI's cyber and counter-intelligence program, Joseph Bonavolonta, said, "The ransomware is that good, to be honest, we often advise people just to pay the ransom."

When even the FBI, with all of the resources at its disposal, says there's no hope, you know things are serious, and some ransomware isn't playing around.

The only way to get data back or access a locked system is to use the encryption key or special code, which the attacker holds on to, threatening to delete it if payment is not met by a deadline. Once the key is gone, the targeted user is left without their data or access to the system. Other methods of recovery that are used include programs sent to the victim after payment that can unlock a system. Of course, that's even if the attacker

makes good on their promise, and even after payment, there's no guarantee a solution will be delivered. You take a risk either way.

Ransomware attacks often infect a system via a form of trojan, such as a downloaded program, email attachment or a hole in network security. This is one of the easiest ways for an attack to bypass security and gain a foothold within a system. Once in, the payload is then dropped, which can take various forms.

One of the most common is the use of something now cslled 'scareware'. You've probably seen these at some point. They're those fake pop-up messages that claim your system is insecure

◄ Always keep your virus scanner, whatever it may be, up to date

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▲ *Browser lockout messages are another common form of ransomware*

or that there's illegal content detected on your PC. They fool people into clicking links or installing software to remedy the situation, and from that point, the ransomware is in. Depending on the type of ransomware infection, the trouble then starts, and the user is forced to pay up if they want a chance to escape the situation unscathed.

By the time you even see the pop-up, your data may be at risk, as a lot of the pop-ups are 'policeware', pop-ups that claim your system has been seized by the authorities due to illegal activity. These request payment in order for the system to be released. These are, of course, fake, and if you really were the subject of such investigation by the police or any other government authority, this isn't how you'd find out, and we doubt any form of payment would change the matter.

Pay Up

Unlike the kinds of intrusion we usually hear about in the media, ransomware creators aren't interested in stealing data or leaking passwords. Payment is what the attackers want, pure and simple. Because this is obviously a very illegal practice, this is usually made using various forms of hard-to-trace transaction. Commonly used methods include wire transfer, premium texts, Ukash, Paysafecard and the popular digital currency Bitcoin. These offer the best protection for the perpetrators of the crime, making it more difficult for their acts to be tracked down. It's not impossible, though, and attackers have been caught.

These payment methods have changed over the years as more options have become available, from ransomware's first attacks, to modern strains that use newer e-currency like Bitcoin. Everything about the threat has evolved, and more ransomware threats are always being discovered. Luckily, security companies are also countering many of these, and there are standard anti-virus solutions to many threats.

Steer Clear

You may be worried that this type of attack is unavoidable, given its tricky nature, and in some respects, this may be true. As with any form of PC security, though, there are things you can do to stay safe, if not totally immune.

First and foremost, you need to be aware, pure and simple. Vigilance and care is always going to be your first line of defence, and ransomware is no different. As it often relies on the downloading of files and pop-up warnings, you can avoid a lot of attack by simply being watchful.

Common Ransomware Strains
CryptoLocker and Cryptowall

By far the most famous (or infamous) ransomware. These two strains are not related, despite the similar name, but both have caused all sorts of problems. These are the examples the FBI was talking about when it advised users pay the ransom.

To give you an idea of how strong the encryption is here, it's likely your home encryption, if you're using any, is around 256-bit. This may vary, of course, but this is common. Businesses may have more powerful protection. It's solid protection, and will keep your data safe.

CryptoLocker used a 2048-bit RSA key pair to encrypt the data. This provided an insane level of encryption complexity. Luckily, CryptoLocker was eventually found and seized by the authorities in 2014. Up to that point, it's been estimated that around $3 million was pilfered by the ransomware.

Cryptowall is still a threat and has another very powerful level of encryption. According to the FBI (via Ars Technica – **bit.ly/1GAp6Y5**), as of June 2015 Cryptowall has amassed around $18 million from victims. The latest variation of it, Cryptowall 4.0, has been made even more effective at avoiding security software, and it encrypts both data and file names.

TeslaCrypt

▲ *Cryptowall is a current threat, so hope you never see this screen*

One of the more recent strains of ransomware is TeslaCrypt. This prays on a specific type of computer user, and that's gamers. This strain targets gaming-centric files such as game saves, replays and other data related to the subject. According to AV vendor Kaspersky, the strain only affects files less than 268MB in size.

It's known to display a HTML warning and is a clone of CryptoWall that apparently demands around $500 from the victim. This price can double if the user delays payment.
CTB-Locker   ➤

As we always advise, be careful about what you download and install, and be aware of the risks some websites carry. Big name download sites will often be safe enough, as they usually try to screen their available content, but this isn't always the case, so don't take it for granted. Websites that skirt the legal, such as pirate download sites and other potentially questionable

▲ *It's not just US authorities that are used to ransom people, and the UK Metropolitan police are often included, as are other regional authorities*

locations are natural breeding grounds for viruses, and that includes ransomware. Always be very wary about downloading from these sites. It's not only illegal to download these files, but your chances of infection are higher.

You also need to be aware of the normal activity of your system day to day. It's very unlikely that a random pop-up you don't recognise will appear to prompt you of any illegal software on your system, and even anti-virus alerts should be recognisable by you, as you know what your own anti-virus software looks like. Just as punishing mails are often easy to spot if you're careful, so too are ransomware attacks, at least a good deal of them.

If you see a pop-up for a security tool you don't recognise or a warning about illegal software you know you've never used, ignore it and certainly don't follow its instructions. To be safe, restart your PC and don't click anything, running your security software and other malware scanners immediately. Instead of closing the pop-up, try using shortcuts like Alt+F4 to kill it.

By far the most effective way to stay safe from ransomware is to take a pre-emptive approach, ensuring your data is safe and sound at all times. This means backing up and doing so on a regular basis. This regularity will depend on the data you need to protect, with data that's updated and used daily needing to be backed up on a daily basis, whereas data that you simply need to keep safe but don't update often needn't be backed up as much. Of course, it goes without saying that you'd need to back up to a location that's not on your actual PC, such as an external hard drive you can disconnect during PC use or even optical media. Just make sure there's no way for the ransomware to find it. It should also be noted that some strains of ransomware specifically target NAS (network attached storage), so don't assume backing up to such a device makes the data safe. It's far more unlikely it'll be attacked, but there is a chance. For the best protection, always use a medium that can be isolated and disconnected from your PC and network.

Make the most of your backup software's ability to perform automated backups, and set it to do so according to your own specific needs. This way, even if your system is attacked by ransomware, your data will be safe and sound, copied to your backup location. You can ignore the threats, format your system and move on.

If you decide to pay up in order to regain access to your data, don't take it for granted that you're safe, even if you do get the data back. There have been many cases of reinfection, and in many cases the actual ransomware isn't removed. For this reason,

▲ *Gamers are a target for TeslaCrypt ransomware*

According to Sophos, CTB-Locker is another encryption-type ransomware that encrypts files on the target machine before issuing a ransom demand. The security vendor describes this strain as being particularly infective, with a high infection rate. It uses powerful encryption tech, as well as Bitcoin and Tor, and it's also multi-lingual.

TorrentLocker
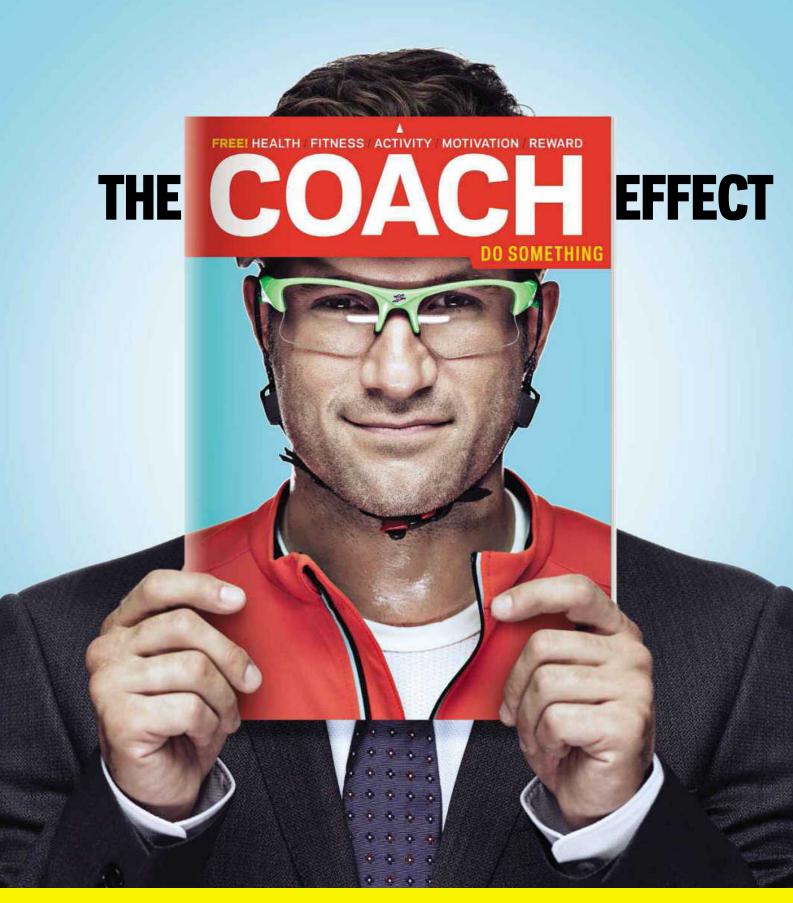
▲ *CTB-Locker is a very infectious breed of ransomware*

Despite the name, this ransomware isn't focused on Bittorent and is usually distributed via email spam. It seems to be a geographically targeted threat, with lures and ransom demands targeted at a specific region. It utilises AES encryption and often masquerades as CryptoLocker to capitalise on the well-known name. It's also self-propagating, stealing email addresses from a victim's address book in order to spread to other users automatically.

▲ *Using the CryptolLocker name, TorrentLocker demands payment for encryption without pretence*

▲ *Some ransomware uses laws and legal jargon to scare users into paying*

it's often a good idea to back up your data and wipe your system with a proper format. Some would also advise you look into changing your IP address and update your security. To change your IP if you have a static address, contact your ISP.

If you do get attacked, regardless of the outcome, always report it, because ransomware is a very real threat and one that the authorities are trying to crack down on. There's no one place to report this kind of attack, and it varies depending on where you live. To find out more, try calling your local police enquiry line (please don't use emergency numbers). You should be able to find instructions on who to contact and how.

Should You Be Worried?

Ransomware sounds nasty, doesn't it? That's because, sadly, it is. Although you may treat it like an illness you always think will happen to someone else, ransomware is a big problem, and although the overall impact of the threat is less now as security software vendors and the public are more aware of it, it's still out there, and being aware of this is important.

We should be concerned, but in the same way as any other PC security issue. As with normal viruses, as long as you're careful, keep your security up to date and keep a healthy backup schedule, you have little to fear.

▲ *Mobile phones are also a target for ransomware scams*

▲ *MoneyPak scams are common ransomware attacks*

Origins Of Ransomware

Although ransomware is relatively new to the public consciousness, it's actually been around since the late 80s. In 1989, the first recorded instance of ransomware was AIDS (Aids Info Disk). This strain altered the system's autoexec.bat file (a very important boot file on older systems of the time). This would count the number of times the system booted up, and when it reached a certain number, it would hide and rename files on the system, making it unbootable. Users had to pay $189 to make the system usable again.

The threat was cracked due to the use of simple encryption, and the creator was caught. This creator, Dr Joseph Popp, created the trojan in what was claimed to be a misguided attempt to do a good thing, as he said the money gathered would be donated to AIDS research. He was declared mentally unfit to stand trial. Today's ransomware creators are not so charitable, however, and money is not used for such honourable purposes.

Future ransomware became more and more complex, and threats such as Gpcode and Krotten were launched, but the world remained largely unaware until 2013, which saw the arrival of CryptoLocker and the rise of Bitcoin. This currency made tracking payments difficult, and in some cases impossible, according to reports. This fact made the idea of ransomware appeal to more and more criminals, who saw a viable and safe method of extorting money.

It's also very important to note that it's not only PC users who are potential targets of ransomware. Both Apple Mac and mobile devices have been hit with ransomware strains, so even if you're not a PC user, you need to be aware of the threat and take action accordingly.

A final question remains. Should you pay if you're held ransom? It depends. Not to sound overly non-committal, it's very hard to advise here with a single specific answer. The FBI and other authorities have advised payment in the past, and others have said you should in no circumstances pay up. The real answer here lies with you and how important your data is. If you're a gamer and you've been hit, potentially losing hours or days of progress in a game, is it worth giving in to such criminals over that? For some players, who have invested huge amount of time in games like *World of Warcraft*, it may well be, but for others, it's just not that important.

If the data held ransom is very sensitive, though, such as financial data, family photos and other important files, the temptation to pay up may be very strong, and no one would blame you for doing so. The importance and threat will vary for everyone, and the answer here is not black and white.

Just be aware that you're dealing with criminals. They may be anonymous faces behind a keyboard and not mask-wearing thugs with guns, but they're still criminals, so they aren't exactly trustworthy. Some people have paid and have received no code to unlock files and, as we've said, some have but have then been reinfected at a later date. Because of this, getting in touch with the police is always a good idea (but we repeat, not emergency numbers; don't clog up those lines).

The bottom line is stay alert, look after your important files, and if in doubt, always err on the side of caution. **mm**

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Top 10 Maps App Features

If you are a Windows 10 user, you have a powerful Maps app on the Start menu. Roland Waddilove lists his favourite features

1 Print Maps

It doesn't look like there is an option to print, but there is. In the bottom right corner of the app, are three dots. Clicking them displays a menu, which includes Print. Click it and a window opens with print options; the printer to use is at the top and the default is selected, so it should be fine for most occasions. There is an option to send the map to OneNote, though, which is useful if you are compiling notes for a project. There is also an option to output the map as a PDF file, which can then be saved to disk, emailed, posted online, shared with friends and so on.

Set either landscape or portrait paper orientation, and select colour or monochrome mode. The More settings link enables you to set the paper size and the print quality. There are five quality settings, three for plain paper, one for speciality paper and one for photo paper. Save ink and time by selecting the Plain Paper, Fast Draft Quality setting.

2 Search Bing

Want to find the best places to eat out or to get a take-away? You could open a browser, go to Bing or Google and search – or use the Maps app. Enter whatever you want into the search box, such as 'pizza', and a panel opens on the left with search results from Bing.

Each result is numbered and there is a corresponding number on the map so you can see the location. The Bing results show a star rating, telephone number, address, price guide indicated by pound signs, and a link to get directions from your current location.

If you enter a location or tourist attraction the search panel shows information about it. You will also see links to nearby places to shop, stay, eat, drink and park your car.

3 Switch Map Styles

Aerial photography and traditional road map views are available and you switch between them using the toolbar on the right. Click the stack of layers and then click Aerial or Road as you prefer.

4 View In 3D

In any map view, there are two ways to switch to a 3D view. Click the grid icon in the toolbar on the right to switch from overhead to about 45°. Alternatively, click and hold the icon, when icons appear on the left and right, drag the toolbar icon left or right to customise the viewing angle.

5 Use Keyboard And Mouse

There are a number of useful keyboard and mouse combinations for moving around maps. Spinning the mouse wheel zooms in and out, but there is a bit more to it than that. It zooms in and out under the mouse. Position the mouse on a point of interest on the map spin the wheel to zoom into that point.

Hold down Ctrl and click and drag up or down the map to tilt it from overhead to 3D perspective view. Press Ctrl and swipe left or right with the mouse to spin the 3D view around 360°. Hold down

⌃ *Select the Print option on the three dots menu and print or save as PDF*

⌃ *Search Bing from within Maps and get a results that change according to the search term*

⌃ *You can choose a satellite-type view if that helps your purposes more*

⌃ *There's more than one way to view the maps. This is a 3D view*

⌃ *You can get a layered view of traffic problems to help plan journeys*

Shift in 3D view and spin the mouse to change your vertical height from the ground.

Got a laptop? Swipe up and down on the touchpad to zoom in/out. Two-finger pinch and spread on the touchpad or a touch-screen zooms in/out too, just like on your phone. Press two fingers on a touch screen and rotate them to rotate the map.

6 View Traffic Problems
Before a journey, you can check Maps for traffic problems. Go to the toolbar on the right and click Layers. Turn on Traffic, Incidents and Cameras. Green roads indicate light traffic and red roads have heavy and slow traffic. Incidents are roadworks, road closures, and accidents, and they are the orange icons on the map. Click them for more information. Click the video camera icons on the map (mostly in city centres) and you can see a live CCTV image of the road.
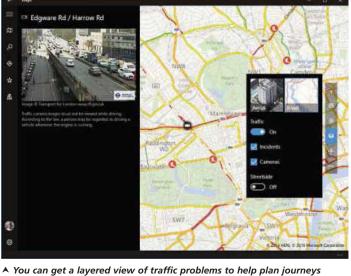
7 Get Directions
You can get driving directions, of course, but also walking instructions, or public transport details such as buses and trains. Click the directions icon on the left (it's a road sign), and a panel opens with A and B boxes. Your current location is automatically entered into A and you just type a place into B. Select the Driving, Public Transport or Walking icon at the top to see the route.

When entering the start and end points for the trip, click the Options link and, when driving, you can choose to avoid certain things like toll roads and tunnels, and ferries where possible. When public transport is selected you can choose the departure time and the route with the fewest changes.

8 View 3D Cities
This is a brilliant feature of Maps that enables you to tour places of interest in 3D. Click the last of the icons on the left near the top and a panel of photos appears. There are dozens of places and to start the 3D tour, just click one. Click the All link at the top to choose a geographic region, such as France, Italy, UK, US and so on. It can take a few seconds for the image to sharpen, but once it is loaded you can then use the keyboard and mouse actions to fly around the location and view it from every angle, from high up to down on the ground.

9 Save Offline Maps
If you travel with a laptop, you might find that you do not always have an internet connection. That's no problem. You can use Maps offline if you download the maps. Click the gear icon in the bottom left corner to open the settings panel, then click Download or update maps. This opens Windows Settings and there is a plus button to download maps. Click it and select a region, such as Europe, North and Central America and so on.

10 Go Streetside
Search for a place in Maps and you might see a photo in the search panel with a Streetside caption. Click it and it places you on the street with a 360° photographic view all around you. Use the mouse to click and drag left, right, up and down to change the view, and click in the distance to move down the street. It is very useful for checking out places before you go there so you don't get lost. **mm**

⌃ *Plan your journeys by getting public transport directions from Maps*

⌃ *Explore cities around the world in 3D. Here is San Francisco*

⌃ *Explore the streets with this Streetside view. Look up, down, and spin around*

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Your Letters

To Hop...

Distro hopping for me was either about finding a distro I was going to be comfortable with for more than a few weeks, or from necessity when a disro wasn't able to work in a particular situation.

I started with Ubuntu and the brown Gnome Desktop, but somehow was never completely comfortable, or maybe it was about 'hey if I can install this, let's see what else is out there'.

Being involved with ICT in Ghana I shipped a load of ex-army Aluminum plated Panasonic Tough books which came with only 122 RAM. I managed to get hold of new compatible 122 RAM from a company called offtek.co.uk in brum, UK to boost it to 256. I naively tried Windows, and after playing with 'Simply mephis' tried an offshoot from it called 'AntiX'.

It installed fine, and I even managed to install edu packages such as from schoolsplay, a sort predecessor of gCompris.

After that I played with a few other distos such as Zenwalk and even ran an Internet cafe in Ghana using Zencafe. Then there was Puppy and one disro that I can not remember, but it had a sort of weird graphic of a spider on its desktop.

I have settled for Slackware and have been using it for a few years; people say its old because I am able to get every package I need from Skype, GIMP , openshot video I have never felt the need to go else where. Occasionally I am tempted for instance kiwix doesn't work since a dependency 'libzim is not available in slackbuilds.org.

I never got around to writing my own slackbuild and have got away just using src2pkg; maybe writing a slackbuild would be an off-the-wall subject for an article ?

Personally, I like the package management system and get around tedious task of installing all needed packages onto a new computer by copying across packageName_SBo.tgz and using a wild card to install them all installpkg *_Sbo.tgz Theres only a couple like clamav that I use a new build on sine it always reminds me I forgot to set up the required user group.

Andrew Brookes

...Or Not

I don't distro hop and never have. I just want a computer that works and keeps working. It is not the operating system I am interested in, but what I can do. I started with Linux because I wanted dev tools I could afford.

In fact the learning curve of changing OS is a real put off. One OS that will run what I need is all I want (please don't let it be windows). Even Microsoft has not got this right. Every new version of windows creates new learning curve pain for little benefit.

OS (front-end) developers feel the need for change just to prove that they have done something. Please just give me small useful changes not whole scale changes for little or no gain.

David

Wireless Hard Drives Test

Interested to read the test, but have to take exception to the review of the Seagate Wireless Plus. I have one (albeit a 1TB, not the 2TB of the test) and the performance is immensely better than described! Write speed under USB of more than seven times that quoted, battery life more than three times that quoted, and wi-fi connection much stronger and more reliable than described (I can access it all over the house).

In many ways the reviews missed the real point of these drives which is to access media 'on-the-move' and they should be judged against that sort of usage: for instance the wi-fi connection will typically be in a car or bus, and the battery life should map to a typical journey time. The battery life of the Seagate is easily as good as any of the tablets (iPad Mini, Google Nexus and Samsung 7") on which we play the TV shows, music videos and movies I have stored it. My best so far was five episodes of *Indian Summers*, which was more than 4½ hours. At the end, I stopped not because I'd run out of power but because the coach I was on had reached its destination!

Also the one thing the review didn't address is the pretty low standard of the Seagate app provided. It is okay but the media player provided is plain bad. However, you can use any other player you wish and I use VLC – or BS Player if I'm using sub-titles.

If the experience was a bad as the reviewer said surely they should have gone back to their supplier and asked to try a different drive!

Dick Pearson

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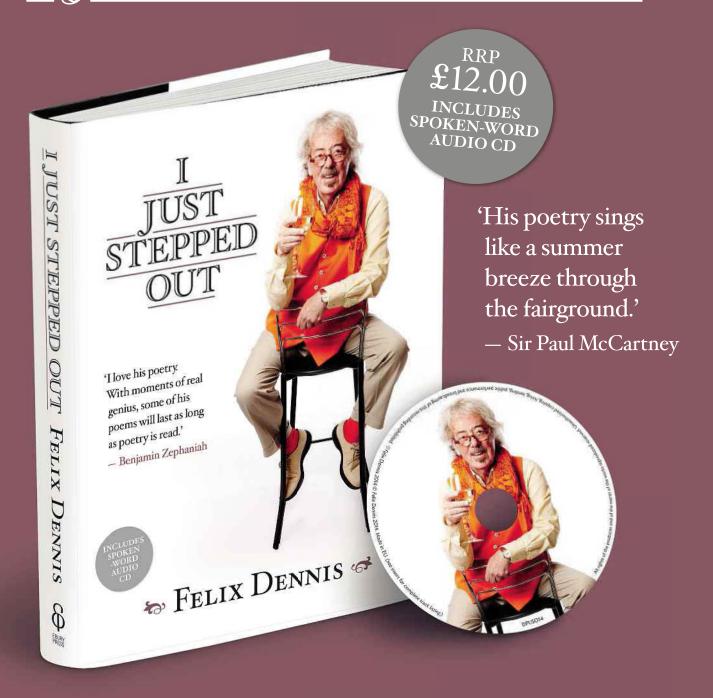
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Component Watch

Want to take you system's cooling to the next level? You don't have to break the bank

The weather's starting to hot up (gradually…) and that means your computer will be too. If you're ready to install a new cooler before the hot weather really arrives (we imagine) then there's no time like the present. Beat the summer rush (any day now…) with this selection of water coolers at every price point, hand-picked and compared so that we can bring you the best price for them all.

Deal 1: Cooler Master Seidon 120 v2
RRP: £45 / Deal Price: £34

Compact and low-priced, as these things go, the Cooler Master Seidon is one of the more basic water coolers you'll find on the market. That, however, still means it will perform better than almost any fan you care to mention! Factory-sealed, with a specially designed 120mm PWM fan radiator that only operates at the minimum necessary fan speed to keep noise levels down, it's a strong first choice. It's even got a built-in power indicator LED so you can be sure the cooler is working even if the fan isn't moving. A good way to get into liquid cooling and the £11 discount isn't to be sniffed at.
Where to get it: Scan (**bit.ly/20atSrg**)

Deal 2: Deepcool Maelstrom 120k
RRP: £45 / Deal Price: £40

Despite the inappropriately chaotic sounding name, this water cooler is actually incredibly quiet, with a closed impeller pump to keep noise and vibration to a minimum. While we're on the subject of that name, it's worth pointing out another potentially misleading aspect of it: although it has 120mm fans, the '120k' bit actually refers to the 120,000 hour guarantee on its ceramic bearing. So, if you're planning to run a system long and hard this might just be the cooler for you. It also has a built-in LED, PWM support and an aluminium heat sink to lower the necessary fan speed. Not bad at all for the price, even though there's only a £5 discount on RRP here.
Where to get it: Ebuyer (**bit.ly/1UZ3voW**)

Deal 3: Alphacool Eisberg 120
RRP: £60 / Deal Price: £48

If nothing else, the Alphacool Eisberg 120 proves that just because a cooler is inexpensive, it doesn't have to look cheap. If anything, this is a little too over to the top. Clearly aimed at gamers and enthusiasts, it's still priced for beginners if you go for this discount. Unusually for all-in-one designs the pump is located on top of the waterblock rather than in the radiator so that might make it easier to seat inside more cramped systems – but let's face it, this isn't a cooler you'd want to buy for its practicality.
Where to get it: Scan (**bit.ly/1NaHAD9**)

Deal 4: Fractal Kelvin Design Hydro T12
RRP: £80 / Deal Price: £75

The entry-level model from cooling geniuses Fractal Design, the Hydro T12 is expensive – but it's also got enthusiast-grade components, and an expandable design allowing customisation to meet specific needs. Cheaper than a pure custom build, and with a silent ceramic pump, it's worth every penny you pay , especially if you want to reduce the noise from a high-end system.
Where to get it: Ebuyer (**bit.ly/1XjfoDB**)

Deal 5: RaiJintek Triton
RRP: £100 / Deal Price: £90

Possibly the best value 240mm cooler on the market, the RaiJintek Triton features a double-width radiator with two 120mm fans, as well as customisable components AND a selection of different coloured coolants that you can use. A great choice for enthusiasts who like style as and substance – just make sure you've got the space for it!
Where to get it: Overclockers UK (**bit.ly/1WeSj6N**)

Tesla Unveils New Motor

April Fool's!

Because technology can be funny too
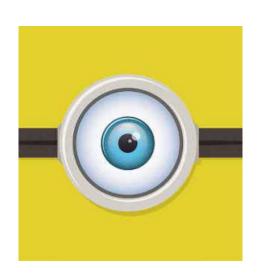
So April Fool's Day came and went for yet another year, and once again the technology world was awash with jokes aplenty.

To go through them all now would be ponderous so we'll just touch on a few. Tesla Motors announced the Tesla W smartphone, a watch that had a huge model of Big Ben sticking out of it, and proved that the best April Fool's gags are the more subtle ones.

Google was, as is typically the case on this day, the busiest of them all, launching various new fake products such as the self-driving bicycle at Google Netherlands and Google Express delivery via parachute. Unfortunately for Google, it's most popular prank also proved to be its undoing. The company started the day by introducing Gmail Mic Drop, a rather silly version of its Send button that, at the end of a mail, added a GIF of a minion character dropping a microphone (a way of denoting the conversation is over, and the 'dropper' has proved their point) and removed the sender from that particular email thread.

While mildly amusing, this quickly turned into something of a nightmare when Google rolled out the prank out for the day. Cue outrage, anger and general lack of mirth among users who had mic dropped in error, with some claiming to have lost jobs over their inadvertently rude response. Google promptly apologised and went to the naughty step.

QUICK BITS... Space-based strategy title Master of Orion has now launched on the Mac

This one is real

Away from Tesla Motors' April Fool's japery, it has revealed a new electric car. The Model 3 will cost 'just' $35,000 which, while still a fair chunk of cash, is less than half the price of Tesla's previous Model S and X cars. Despite this, the company is suggesting that it will travel over 200 miles on a full charge, seat five people, reach 60mph in six seconds and feature a touchscreen panel in the centre console.

This spec and pricing means the Model 3 could be Tesla's attempt at a mass-market vehicle, with its development having been funded by sales of higher-end vehicles. It's not going to be available until late next year, but there already seems to be plenty interest among consumers, with over 270,000 pre-orders taken in the three days following its reveal.

We look forward to seeing video footage of these at some point next year.
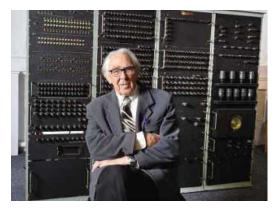
HEC On Display At TNMOC

Another great exhibit

Britain's first mass-produced business computer has gone on display at the mighty National Museum of Computing at Bletchley Park. Another impressive addition to the Museum's ever-expanding range of exhibits, the Hollerith Electronic Computer (HEC) was first revealed to the public over 60 years ago. Indeed, it played a key role in the global computer take-up, being the first computer installed in many countries.

TNMOC now hosts the first version of the bulky 2m x 3m metre HEC in its First Generation Gallery, where it stands alongside the Museum's other famous machines, including the EDSAC and Harwell Dekatron / WITCH systems. Pictured here is Dr. Raymond Bird, the engineer tasked with developing the HEC computer originally.

For more information on this and the other interesting exhibits the Museum has on its site, visit **www.tnmoc.org**.

Some time in the 1990s, I had my first hands-on experience of virtual reality. It was at the London Trocadero, and it was one of the vehicle type of Virtuality machines, which saw you sitting down with an enormous headset on, and paying about five quid for the privilege.

As it turned out, it was rubbish. Either the machine wasn't working properly or I wasn't wearing the headet correctly, because all I remember seeing were a few coloured blocks on a very blurry-looking screen.

Nevertheless, the idea of virtual reality has always been exciting, and more recently I've played around with Google Cardboard on my mobile phone. This, in spite of its simplicity, is enough to convince me that this technology is finally ready for the big time.

I've yet to try the Oculus Rift or HTC Vive and, unless I get a press invite to try one, I'm probably going to be priced out of owning one for a while. But the price will come down, and I'm fairly sure I'll be jumping on this bandwagon at that time.

How about you? Will you joining the VR revolution, or do you think it's just a fad? Write to **letters@micromart. co.uk** and let us know.

Anthony

Editor

Meanwhile... On The Internet...

The revelations emerging from a massive haul of data removed from the network of Pananmanian firm Mossack Fonseca was defintely the biggest story of last week, and could have the potential to be the biggest story of the year. So big is the tranche of information, something around 2.6TB (yes Terabytes, just in case you were still unsure if that was a typo) of data, comprised of 11.6m documents and emails, that it was shared by Germany's *Süddeutsche Zeitung,* with the International Consortium of Investigative Journalist (ICIJ: **panamapapers.icij.org**), which then shared it out among various news organistions from all around the world.

At the forefront of UK analysis of these so-called 'Pananma Papers' was *The Guardian* (**tinyurl.com/MMnet09a**) and the BBC's *Panorama* team (**tinyurl.com/MMnet09b**), which broke the news as part of a co-ordinated, worldwide reveal on April 3rd. A reveal that came after almost a year of secretive work, that began when journalist Bastian Obermeyer was initially contacted by his source via encrypted chat (likely, according to a *Wired* report, to mean services such as Signal (**whispersystems.org**) and Threema (**threema.ch/en**). Indeed, it has left many flabbergasted that the information didn't leak sooner (**tinyurl.com/MMnet09c**).

The moment the story broke, it instigated a firestorm of mind-boggling analysis, which exposed some pretty horrible home truths about how the rich and powerful hide their assets from tax authorities through the use of offshore companies. It wasn't pretty, and the numbers were, frankly, astronomical.

While, in terms of the kind of shockwaves it is sending out around the world, it is easy to try to draw comparisons between the Panama Papers and the leak of American NSA secrets by Edward Snowden (estimated to be about 1.7m documents), or Wikileaks' release of the 'mere' 1.76GB cache of cables lifted by Chelsea Manning in 2010, but this is a very different ethical beast.

For a start, this is not an inside job, it is – at least according to the Mossack Fonseca (**tinyurl.com/MMnet09d**) – the work of hackers, an explanation that seems to be backed up by *Wired*'s investigation of its "outdated" computer systems (**tinyurl.com/MMnet09e**). Therefore, while the information may expose plenty of shady behaviour its release has not been driven by conscience of a whistleblower with inside knowledge... which seems to go some way to making it an event more on par with the hacking of celebrity iCloud accounts.

Many, ourselves included, ppinted out that Celebgate (aka, 'The Fappening' *shudder*) was a crime and a gross invasion of privacy. Also, we pointed out that, while it's easy to point fingers and simply blame the victims for being 'stupid' enough to leave naked pictures of themselves in cloud storage, the people affected also had the right to expect those pictures to remain private.

At the moment, we don't really see anything different here. As strong as the urge to stick it to the 1% may be, and despite the fact you'd need an electron microscope to see the violin we're playing for all those mega-rich 'victims' right now, until we have a better idea about exactly who – or, should it be state-sponsored incursion, 'what' – was behind the release of these documents, it almost pains us to say that in-depth analysis of any individual's ostensibly legal tax reducing tactics is a little beyond the pale (**tinyurl.com/MMnet09f**). While it's also easy damn some of the world leaders involved in the whole affair, Vladimir Putin and your mates we're looking at you, the shadowy source of the information may also give more creedence to claims that the whole affair is an attempt to destablise governments than we'd perhaps care to collectively admit (**tinyurl.com/MMnet09g**).

Even the ICIJ admits that most of what Mossack Fonseca was up to is technically legal, and there's no law against going against the spirit of the law. It's this fact that appears to be at least some of the motivation behind it protecting the raw data so fiercely, and its refusal to hand it over police authorities or release it all, Wikileaks-style.

The whole right to privacy thing cuts both ways, we suppose. Though when *House Of Cards*' sociopathic President, Frank Underwood, is being fired in withering GIF form as a response to your Tweets, you know you're on shaky moral ground (**tinyurl.com/MMnet09h**). Eh, Mr. Cameron?

There have been two big announcements from Reddit this week; firstly a welcome new set of tools to help combat the nastier sides of the site's communities (**tinyurl.com/MMnet09i**), and also the release of it's much-wished-for apps for iOS and Android (**tinyurl.com/MMnet09j**), making it easier for Redditors to wrangle their subreddits on the move.

Next week: pigs fly!

Even as authorities on both sides of the Atlantic (**tinyurl.com/MMnet09l**) are gearing up to force tech companies to decrypt-on-demand, WhatsApp has announced full end-to-end encryption of messaging via its service (**tinyurl.com/MMnet09k**). It's not all it immediately appears to be, though, as the firm will still have access to all-important metadata of who's speaking to whom and when (**tinyurl.com/MMnet09m**).

.AVWhy?
Videos For Your Eyes...
Not Necessarily For Your Brain

What did you expect, seriously? Of course the trailer for *Rogue One* (or, *Rouge One*, as certain auto-correct systems would have it: **tinyurl.com/MMnet09n**) was our favourite video of last week. We mean, really... just how badass do Forest Whitaker and Donnie Yen look? Is that Biggs? It must be Biggs, right? Mon Mothma, Imperial Guards, AT-ATs... It was some high-level fan service, no doubt. No Mads Mikkelsen, though (**youtu.be/Wji-BZ0oCwg**). Shame.

QUICK BITS... **Fitbit has announced that it's shipped over a million Blaze models within a month of being launched**

Caption Competition

"What do you mean 'The screen seems blocky'?"

This blocky bloke was the subject of our caption competition from issue 1406. Here are the best of the submissions from our readers...

- **doctoryorkie:** "I've found the any key. Now how do I press it with these hands?"
- **Ondrive:** "Let's see if we can get this brick of a laptop up and running again..."
- **doctoryorkie:** "What do you mean 'The screen seems blocky'?"
- **Justin Green:** "Despite being a cyborg, TK-241 was easily confused when it came to computers."
- **doctoryorkie:** "Wow. Look at those cool *Minecraft* graphics!"
- **Thomas Turnbull:** "I shouldn't have upgraded the bios the computer's bricked now."
- **Ondrive:** "Absolutely NOTHING was awesome in the IT department that morning..."
- **Martin Prince:** "Working for Lord Business was a rough gig."
- **ricedg:** "So that's what happened to Plastique Bertrand."
- **Wudger:** "*!^#ing spellcheck. The name's Legolas, NOT 'Lego Lass'!"
- **Ondrive:** "Marcus needed to get a grip on the firm's accounts, but his hands couldn't even get a grip of his desk."
- **Thomas Turnbull:** "I asked to be Legolas in Lord of the Rings and I ended up being Legolad instead."
- **Peter Hopkins:** "Can someone help me to the toilet, please?"
- **Thomas Turnbull:** "The Lego version of Windows 10 seems to have made some changes to my system I wasn't expecting"

The winner, though, is doctoryorkie with "What do you mean 'The screen seems blocky'?"

If you have a caption for the picture below, head to the 'Other Stuff' section of our forum (**forum.micromart.co.uk**), or email us your funnies via **caption@micromart.co.uk**, remembering to add the issue number to the email.

Project CARS' €20,000 Prize Pool

E-sports challenge will include Birmingham event

Following last year's inaugural Project CARS e-sports season, things will continue apace this year as the fastest drivers in the world will be playing in the ESL Weekly Cups and a bunch of live events held in Madrid, Cologne, Paris and our own fair city of Birmingham.

There is also a significant prize fund for 2016 with a total pool of €20,000 made up of €5,000 prizes for the team coming on top of its division. Who said gaming doesn't pay?

As for the game itself, look out for the Game of the Year edition for PC, PS4 and Xbox One on 6th May.

Kingston's Action Camera Memory

Speed Class 3 card

Flash memory specialists Kingston Digital has announced its microSD Action Camera UHS-I U3 (Speed Class 3) card. Promising rugged performance and a form factor ideal for most action cameras, including the GoPro and drones, the card features speeds of up to 90MB/s read and 45MB/s write, so can capture life's everyday adventures. Its performance levels and outdoor-focused properties – this is waterproof, shock proof, X-ray proof and temperature proof – means enthusiasts can shoot in 4K or even 240fps wherever they are.

The card is available in 16GB and 32GB capacities, with the 64GB version due at a later date. There is also an optional SD card reader if you need one and more details on this can be read at **www.kingston.com**.

Trump Downed By EA

The presidential campaign in the US has been, we're sure you know, a somewhat noisy affair as Donald Trump has managed to offend an awful lot of people. Now, 'The Donald' has only gone and offended Electronic Arts too.

EA ordered a YouTube video to be taken down that used audio from *Mass Effect 2* as part of a video of the man himself that appears to be in favour of his campaign – certainly, Trump himself tweeted to the video. Either way, the games publisher wasn't happy and it ordered the takedown. The presidential campaign, however, continues.

Amazon's New Kindle

By the time you read this it may already be out there, but at the time of writing, Amazon boss Jeff Bezos had tweeted "Heads up readers – all-new, top of the line Kindle almost ready. 8th generation."

Clearly, we have no idea what this new Kindle will consist of or cost but we are excited to see the company revamping its Kindle line nonetheless. Let's see how this one fares after the 7th Gen Kindle Voyage. If nothing else, it will give us, and we're sure plenty of other sources, a chance to run with the following headline: 'Bon Voyage, Voyage'.

Unplug In June

So here's a heads-up to mark June 26th in your diaries. That particular Sunday is National Unplugging Day, which asks parents around the UK and beyond to pledge to spend the day unplugging from technology. The idea behind it is honourable, of course, as it looks to make families sit around the dinner table for Sunday lunch without constant distractions. Last year, over half a million parents took the pledge. The big question is how many of them actually followed through with it, but we get the idea anyway.

Kickstart Campaign Starts For VR Headset

£40,000 sought

The campaign to launch the first portable Virtual reality headset with integrated audio has been launched in earnest on Kickstarter. Called Opto, its designers boast that audio will be integral to the product, as speakers sit within the headset itself maning there's no need for additional headphones.

Opto will support any smartphone with a screen size between 4" and 5.1", using a unique magnetic front cover mechanism to allow for quick and easy attachment and removal of the phone. Made out of a patented closed-cell foam material, this headset also promises to be tough, lightweight and comfortable to wear.

The people behind this are looking to raise £40,000 by April 29th, which will then be used to manufacture the first 500 devices. If you'd like to help out, you can support the campaign over at **optovr.com/kickstarter**.

In other, unrelated virtual reality headset news, Oculus found itself in the slightly embarrassing position of having to refund shipping costs on its headsets as an "unexpected component shortage" has meant delays in getting them out to early pre-order customers.

Fair play to the company for not dragging their heels on this issue, though.

Heads Up

Gaming headset from HyperX

Kingston's HyperX division has revealed the newest member of its Cloud headset range, the HyperX Cloud Revolver. Available for pre-order now, the headset will ship on May 9th. This particular headset boasts a studio-grade sound stage with 50mm directional drivers to deliver wider depth and width for improved audio precision in first-person shooter and open environment games. The bods at Kingston also promise a "concert hall-like experience" for music.

For comfort, there's signature red memory foam and "premium leatherette" on the ear cups and headband that should see you through hours of gaming, and a detachable noise-cancelling microphone completes the experience. The website for more info is **www.hyperxgaming.com**.

QUICK BITS… Quantum Break came out on the Xbox One. Reviews were, it's fair to say, very mixed

One In Three Of Us Suffers Data Loss

Yikes

Did you know that world Backup Day was even a thing? It was actually held on March 31st and the idea, obviously, is to raise awareness of the importance of looking after your digital data.

Data protection outfit Acronis carried out a study around the day to better inform people about how troubling the issue of data protection is, and its results told us that one in three of us have suffered data loss at some point. The study of global respondents also showed that nearly half have over four devices in a household and that over half worry about losing photos and videos the most.

As for where people back up, 35% use external drives and 39% use the cloud. How about you?

Check Your Web Speed Now

Ofcom's Checker tool could help to plan ahead

Ofcom has updated its Mobile and Broadband Checker tool, using data coming directly from ISPs to lay out the broadband speeds you can expect to receive at any given postcode in the UK.

The communications regulator has said that the Checker can be used by businesses looking to relocate and consumers that might be looking to move into a new home or area. Letting us check what state the broadband of an area is before getting there will certainly mean no nasty surprises are in store on moving-in day and it will also act as a handy tool for making yourself all cross (or smug) when you compare your own broadband speeds with your fellow neighbourhoods.

The Checker tool (**maps. ofcom.org.uk/check-coverage**) displays average speeds on Standard (under 30M/s) and Superfast (30 – 300Mb/s) broadband connections with data collected between May and June last year.

Turkey Suffers Massive ID Theft Hack

When we say massive, we really do mean massive

When it comes to horror stories about data protection issues, this could be as bad as it gets. We're talking about a database, apparently relating to Turkish citizenship, that has been posted online purporting to contain the personal data of nearly 50 million people.

The reality of that number is that this could mean trouble for over half of the country's population, as National ID numbers, names, dates of birth and addresses were all included in the information. At the time of writing, hadn't been independently verified for its validity. If it's real, though, this is bad.

BlackBerry Suffers Poor Quarter

More trouble ahead for mobile firm?

BlackBerry encountered yet more disappointment as its fourth quarter revenues were not as favourable as hoped.

Sales of the PRIV smartphone were not as strong as the firm would have wished for, and the poor results have led to a decision in September on what to do with its hardware business. CEO John Chen has said that he's a "realist" and that he realises that there is little benefit to staying in the mobile hardware game when it's losing the firm money.

Media reports say BlackBerry is planning to release another smartphone before then but, with the much-touted PRIV underperforming, are there really many more throws of the dice left for BlackBerry in the mobile hardware market? John Chen clearly isn't sure.

BenQ BL2420U

A monitor made for designers, with some tantalising extras

DETAILS
- **Price: £355**
- **Manufacturer: BenQ**
- **Website: goo.gl/EOzB1O**
- **Requirements: Capable GPU for 4K resolutions, spare USB port to activate hub**

▲ *The BenQ BL2420U is a great 24" monitor*

▲ *Connectivity is excellent, as is the screen quality*

The BenQ BL business range of monitors has so far proved to be quite impressive. We've already had the BL2420Z and BL2711U through our doors, and each has shown great quality and design.

Now we have the BL2420U to look at, a CAD/designer monitor that ups the business series ante with higher-end performance and even more features.

The BL2420U is a 23.6" IPS LED backlit screen that manages to dish out some stunning looking visuals at a maximum resolution of 3840 x 2160 at 60Hz. It has a native contrast ratio of 1000:1 and a dynamic contrast ratio of 20,000,000:1, with the usual excellent 178° viewing angles that IPS monitors offer.

Connectivity is excellent, with both HDMI 1.4 and HDMI 2.0 ports available, as well as DVI and DisplayPort 1.2a. It also has a two port USB 3.0 hub located along the output/input strip at the back of the screen, together with a headphone jack and line-in.

With this being a BenQ product, the company has naturally ensured that the BL2420U has inherited the low blue light levels and other special screen modes available, alongside an anti-glare screen coating and flicker-free technology. There are specialist CAD/CAM modes to help bring out the definition in wireframe images, animation modes to enhance details in dark shadows, and a ten-level brightness function to help improve the clarity of the screen.

Of course, the 4K UHD resolution makes a big difference too. For media duties, which it was designed for, it excels and produces a remarkably crisp and superbly clear image. For gaming, it looks equally fantastic, although it did seem to struggle with faster-paced titles.

All in all, the screen quality is quite wonderful. The colours are as accurate as we can determine, as well as being bright and rich without looking washed out, as many high-level brightness monitors can make them seem.

Ergonomically, the BL2420U takes a leaf from its business-bred brethren. You can pivot, tilt and adjust the height to 140mm if needed, and it also has an auto-orientation feature to rotate the screen as you move it from landscape to portrait modes.

The BenQ BL2420U costs in the region of £355, a price which we think is very reasonable what you get.

It has plenty of connectivity, it's ergonomically sound, and the added bonus of 4K brings the BL2420U to the top of the 'must have' pile. In short, it's an excellent monitor for both business users, designers and casual users who want great screen technology.
mm David Hayward

A superb 4K monitor, with plenty of extras

EDITOR'S CHOICE micro mart

micro mart
9 Quality
8 Value
9 Overall

Magix Youcast
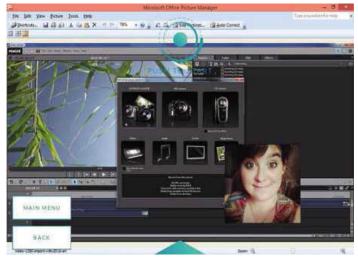
Get your vlog or YouTube videos online quicker with the new Magix Youcast

▲ *You can create a taking head type production using your webcam*

▲ *The global settings allow you to set output options and control shortcuts*

▲ *You start each new session with an appropriate template*

There's no doubt we live in a very visual age, where people share their lives (however boring) online and vloggers offer us news, rants and reviews and introduce us to hobbies we never knew existed. Most of these are lashed together with some flavour of video editor or simply uploaded to sites like YouTube straight from smartphones, warts and all. Nevertheless quite a few internet stars have risen in this genre, with followers to rival those of pop and film stars. To be fair, though, these folk have crafted their content to quite a sophisticated level, using high-end graphics products, produced using professional cameras and microphones. Many of these also host live streaming events, to bring their particular brand of 'entertainment' to their ever hungry followers.

If you'd like to join this select bunch and create some of your own notoriety, you don't have to spend bucketloads of money on such expensive equipment, because Magix has produced a new product that in theory should get you up and running much more easily.

Youcast is the name of this new product, and it's totally different from any other video-based product from the company. It's very much based on a live interface, which is designed specifically for hosting live shows, creating game walkthroughs or documentary style tutorials – in fact, any type of production that would incorporate video with a live host. That doesn't mean you need to have a live host; if you're camera shy, you can still use it to create your podcasts or whatever type of production you dream up.

Although the interface is considered to be intuitive, I found it somewhat confusing at first, because of its almost unique design. I must admit I didn't delve too deeply into the online help at first, so I think you'd better consider this your first port of call.

There are three modes of operation, determined by the template you chose for your project: GameCast, ScreenCast or LiveCast. With GameCast, a game can be selected and will launch when you start your broadcast. At the same time, you can insert a live video stream from a camera or webcam, then you can appear and comment on the gameplay as it's played. ScreenCast is mainly used for vlogging or tutorials that would be prepared beforehand. Like GameCast, there's the facility to overlay video, text or images to enhance your production. Finally, LiveCast uses your webcam as the primary video source, and once again you can pull other elements into your productions from the media trays. These are common to all the templates and can be controlled with keyboard, mouse or, if you have a touch screen, gestures.

If your webcam supports Intel RealSense, it should be capable of extracting your image from the background without the need for the conventional green screen used in chroma key effects. As I don't have a compatible camera, I wasn't able to test this function.

Unlike most Magix products, the effects that come with Youcast are rather limited; the same applies to text effects, which fall far short of what we've come to expect from Magix. And considering the ethos behind the product, I don't think it delivers what it promises. It's not particularly easy to get to grips with, and the interface is rather cumbersome. When you think of the sophistication of most of the Magix range, Youcast has a decidedly amateur look and feel to it.

However, don't take my word for it. You can try it for yourself, because the company offers a free 30-day trial of the full product to get you hooked, then if you like it, you have to pay a monthly or yearly subscription. I must say I'm not a fan of buying software like this; I prefer to pay once and then decide if the next upgrade is worth paying for.
mm Joe Lavery

Doesn't really deliver what it promises

micro mart
7 Quality
7 Value
7 Overall

LIFX 1000 Color Smart Bulb

Dispel those dark winter hues with controllable coloured lightbulbs from LIFX

I'm not sure about you, but coloured lighting in my home isn't a high priority. However, many people do like to alter their mood chromatically, and for them LIFX has created the 1000 Color Smart Bulb.

For those following the smart home device trail, Philips got into this market earlier with its Hue bulb range, but in almost every respect the LIFX 1000 series is superior. Where the Philips Hue needs an associated hub to be networked, LIFX bulb offers self-contained wi-fi, reducing the cost of a single bulb installation.

LIFX made some earlier 800 series designs, and this product represents its second generation, delivering greater brightness and functionality.

To get it operational, you simply screw it into a socket, access its own wi-fi access point using a phone or tablet. And then you give it your email credentials and access your router to complete the connections.

I had some minor issues with this part. LIFX's Android app insisted I first turn off the 'Avoid poor wi-fi' feature. That hasn't been in Android since KitKat if I'm not mistaken, and it wasn't a feature on Marshmallow.

After a few attempts, it all worked, and once the bulb was logged against the LIFX cloud account, I got control across a range of devices. You can have more than one bulb under the same account, and you can group them based on named locations.

Control is via a phone or tablet app (Android or iOS), an Apple or Android wearable or even through a Windows 10 PC using a Universal App for that platform.

But what's really cool is that once you've got the LIFX app on your device, you can even control it with your voice using Google Now, Siri or Cortana.

At least that's the theory. I had some success calling the Life X app directly from Google Now, but more general statements like "Okay, Google, set my lights to blue", didn't work for me. They should, and I suspect they will with some work on my part.

Should you have more success, the range of commands available is impressive. Along with turning on and off, and asking for specific colours and themes, you can also brighten and darken, all by voice. It also supports Amazon Echo.

Personally, I found the official Android app easier to use, and it has all manner of controls for colour cycling, and even themes for specific uses, like watching movies.

At the simplest level, this is an LED light that you can control the brightness of and which can output a maximum equivalent of an old 75W lightbulb or 1055 lumens, while only using 11W at full brightness.

The wonders of LED technology know no bounds, and it can also generate a very wide range of colours from aqua blues and verdant greens to zippy reds and even deep Trump orange. The colour temperature range starts at 2500K and goes up to 9000K.

Colour representation is a major improvement over the Philips Hue, because despite the name, those bulbs don't do some specific colours well at all.

Like the Hue, the LIFX can also be linked into IFTTT recipes, linking its features to other IoT (Internet of Things) devices. Doing this make the bulb flash to music or change colour when the heating comes on – or whatever convoluted craziness you can come up with between whatever other

IoT devices you own and user definable events.

One nice example I tried was to make the light glow orange precisely at sunset, rather than at a hardwired set time each day.

I have only a few reservations about the bulb, one being its weight. At 240g this is much heavier than a typical lightbulb, and it might pull on wiring that isn't sufficiently secured. The shape is also fatter that a typical bulb at the base, and that might interfere with some fittings.

The review bulb came as an E27 screw design, but LIFX also makes this bulb in a more UK-house-friendly B22 bayonet edition.

The use of 2.4GHz frequency range to communicate does make it clash with a few commonly used appliances, and amusingly LIFX's FAQ tells you to place it 25ft away from a microwave or cordless phone. That would be the neighbour's house for me and most people in the UK, realistically.

The cost, as they say, is the cost. But I find it depressing that it's just $60 in the USA for an almost identical product. Whatever you pay, these aren't bulbs you'll be replacing yearly, because based on three hours a day of usage, the life expectancy is an impressive 22.8 years.

If you can stomach the cost or have a friend stateside, then the LIFX 1000 is definitely the smart bulb to have right now, and it's significantly better than other controllable colour LEDs I've seen. **mm Mark Pickavance**

The best colour smart LED bulbs yet

micro mart

8 Quality

6 Value

7 Overall

SteelSeries Siberia 350 RGB 7.1 Surround Sound Gaming Headset

Steelseries entices gamers with a pair of marvellously effective cans

Not long ago, I reviewed the SteelSeries Siberia 200 headphones and found them to be a pleasant audio experience. The Siberia 350 headphones cost 50% more, so quite reasonably I expected more from them.

In terms of general comfort, these are as good if not better than their stablemates, but where the real difference lies is in how these they're coupled to the audio source.

Where the 200 series use a de facto 3.5mm audio jack, these need USB to easily allow for the DTS 7.1 surround sound support that they're capable of. This means that they're not dependent on whatever sound hardware you have in your PC, because they're headphones and a USB sound device combined.

And in going that route, the number of devices they can support is immediately whittled down to that which can handle sophisticated USB devices.

At this time, they're designed to work with a PC with the SteelSeries Engine 3 software installed, Apple Mac and the Sony PS4.

The elephant in this room is the lack of Xbox One support. That's rather odd considering that particular console is now running a version of Windows 10. And if Microsoft is the sticking point to them working on that platform, it might never be resolved.

For PC users, however, they work flawlessly as both an audio output device and also as a microphone. Driver installation is automatic on Windows, although to access some of the more exotic features, like the RGB lighting, require a visit to the SteelSeries website for the software.

With SteelSeries Engine 3 installed, per-application profiles are available, tweaking the audio and lighting to specific titles using the Gamesense technology.

For example, you can configure the headphones so that when you play a particular game, the LEDs turn red if you hit low health. As you can't see them while they're on your head, I'm not sure how this helps, but it's one of the many things you can do.

Probably more useful is a full five-band equaliser and the ability to toggle DTS separation on and off.

Because Engine 3 works with all current SteelSeries hardware, including mice and keyboards, you can synchronise the Siberia 350's LED colours to any other SteelSeries hardware you own. Recently, it has added cloud storage of these settings under a SteelSeries ID, so you can automatically replicate all configurations between multiple computers.

As interesting as all these feature are, what I find much more convincing in the Siberia 350 is the quality of the audio. The 50mm neodymium drivers generate sound that's delightfully crisp, and it spans an impressively wide frequency range. Spatial audio effects are well rendered, allowing you to access the direction of incoming fire and the resonating roar of

Key Features
- 50mm Neodymium Drivers
- Onboard USB Soundcard
- Headphone Frequency Response: 10 - 28000 Hz
- Headphone Sensitivity: 80 dB
- Microphone Frequency Response: 50-16000 Hz
- Microphone Pickup Pattern: Unidirectional
- Microphone Sensitivity: -42 dB
- Microphone Impedance: 2200 Ohm
- Cable Length: 1.5 m
- Connector Type: USB

EDITOR'S CHOICE
micro mart

engines with equal clarity. Combat games, music, movies – it's all good.

In terms of hardware controls, there's a volume dial on the cable and a microphone mute switch behind the left earpiece, where the retractable mic resides.

The microphone seems a notch up from the 200 series and as good as I've used on a headset that's £150 or less. If you want better than this, then you need to consider the Siberia 650 or its ilk, if you can afford them.

In addition to the microphone, the other major upgrade over the 200 series is the memory foam ear cushions. These enabled me to wear the Siberia 350s for a very long, multi-hour gaming session over the Easter weekend, without any discomfort or overheating issues.

If there is a caveat to these headphones it's the USB cable and specifically how short it is. At just 5ft (1.5m), it makes no accommodation for the PS4 owner who has his/her console

under a TV at least 10ft away. A USB extender isn't expensive, but SteelSeries should have considered this issue and included an official one in the box.

That point aside, and the fact that you can't use these with general music devices, these are still exceptionally well made and designed, and certainly worth what SteelSeries is asking for them.

The only real question here is black/orange or black/white, because unless you like to spend

silly money on headphones, these are almost perfect for gaming on a PC.

I do hope at some point that they're made compatible with the Xbox One and that SteelSeries extends the USB cable somehow, because if it did that, then these could easily become the new gold standard for gaming audio. **mm Mark Pickavance**

An excellent gaming headset for PC and PS4 gamers

micro mart
9 Quality
9 Value
9 Overall

BenQ GW2870H

As Henry David Thoreau once said, "Simplicity, simplicity, simplicity!"

While BenQ usually offers users a plethora of features with its monitors, the company has taken a slightly different approach with the GW2870H. quoting the embodiment of the Bauhaus "less is more" philosophy.

The GW2870H is a decent-sized 28" VA LED panel, with a maximum resolution of 1920 x 1080, a 5ms GtG response time, 3000:1 native contrast ratio and 20,000,000:1 dynamic contrast ratio. Viewing angles of the VA panel are as good as an IPS screen, at 178°, and it has a more than reasonable level of brightness.

Connectivity consists of VGA and a couple of HDMI ports, along with a headphone jack, which is generally enough for most setups.

Other than the low blue light filter that accompanies every BenQ monitor, and the anti-flicker technology, that really all there is about the GW2870H. It's a minimalist's dream, and because of the lack of extra bells and whistles, BenQ has managed to cut the price down to an extremely reasonable £170 (on average).

The screen quality is certainly good enough for most users. It won't win any awards on the gaming front, and it lacks the higher-end quality that the BL-range or XL-range has to offer, but it'll

▲ *Although low cost, the BenQ GW2870H provides an above average display*

▲ *It's a simple monitor, but one that's well priced*

> ❝ **BenQ prides itself on making on-screen menus that are simple** ❞

suffice for everyday use. There's nothing wrong with it not being a gaming or design screen, but it's not going to give you the same quality of visual output as something that costs an extra hundred pounds or so would offer.

In all fairness, the GW2870 manages to offer a higher than average display. The colours are good, with exceptional black levels. The brightness is good too, thanks in part to the use of a VA panel. In fact, the default setting, we thought, was a little too bright for our tastes. Thankfully, altering the settings is easy enough. BenQ prides itself on making on-screen menus that are simple and quick to navigate.

There are several screen modes available (Game, Movie and Photo), but in all honesty they're not quite as accurate as we've seen in the past from other BenQ models – each adding a tad more sharpness or increasing the colour temperature, for example.

Although it seems on paper like an underwhelming monitor, the BenQ GW2870H is actually a good choice for home users. If you're not too bothered about ever hitting 4K resolutions, then the GW2870H is the monitor for you.

Basically, for £170 you're getting a good 28" screen with a better than average screen output.
mm David Hayward

A minimalist monitor, but one that's above average

micro mart

7 Quality

8 Value

7 Overall

Devolo dLAN 550 WiFi Starter Kit

Devolo delivers modest improvements to its dLAN range

German engineered Devolo dLAN technology has some of the best Powerline gear I've used, bar none. But I accept that not everyone can afford its gigabit-capable tech or, indeed, need it. For many, its dLAN 500 spec gear is fine and affordable, especially if all they're trying to do is deliver networking to a child's bedroom or wi-fi inaccessible location.

That's exactly the thinking behind this new dLAN 550 WiFi starter kit, although as the number hints, Devolo has given a small performance boost to what was an already excellent design.

The kit consists of two parts: a dLAN 550 Duo+ and dLAN 550 WiFi access point. Each of these can be bought separately, but without having both or their equivalents, they're largely redundant.

The 550 Duo+ is a rather large item that ideally you'd place in the socket your router takes power from, and then plug that into this powerline device. I'm still not happy that the Ethernet ports on these designs are on the top and not the bottom, but at least they offer through-power, and two Ethernet ports. This means you can drop it into an existing situation without needing to find extra ports or sockets.

The dLAN 540 WiFi is much less obtrusive, and while it doesn't offer the through-power socket, it does have both localised wi-fi and a single Ethernet port wherever in the house you choose to place it.

In this product, Devolo is offering 802.11n wi-fi using just the 2.4GHz range, as it's kept 'ac' for its dLAN 1200 range at this time. That's still capable of up to 300Mbps, with the right client connectivity.

The only caveat to using powerline gear is that both items must be on the same ring main, so they can effectively communicate over the electrical power system.

In terms of the speeds, as I've mentioned before, these are largely theoretical and are very dependent on the quality of your wiring and the devices at either end.

It's also worth noting that while this is designated '550' gear, the quoted wired network speed remains unchanged at 500Mbps, making the new numbering something of an oversell. In my testing, I got around 150-165Mbps, a level I was realistically expecting, and that's plenty for general surfing, streaming movies and music.

If this design has a problem, it's one that Devolo made all for itself. It's still selling the dLAN 500 WiFi starter kit for about £60, offering very similar capabilities.

The big advantage of this kit is the pass-through power, though you can buy the dLAN 550 Duo+ for £40, and with the dLAN 500 WiFi kit you get an extra dLAN Ethernet adapter for the same total price.

For £149.99, you can get a bigger kit that has two 550 WiFi adapters in it, or you can get a single dLAN 550 WiFi adapter for £59.99.

If you want speed, go dLAN 1200+ and a low-price the dLAN 500. Either way, they make the argument for the dLAN 550 WiFi Starter Kit a little less compelling, unfortunately.

mm Mark Pickavance

High-quality powerline kit for wired and wireless networks

micro mart

8 Quality

6 Value

7 Overall

Mechanical keyboards represent the higher end of the peripheral market, offering greater longevity, extra features and a higher degree of performance than you'd get from membrane-based alternatives.

Whether you're a gamer or a casual user, the really can make a huge difference to your computing experience.

Mechanical Keyboards

Das Keyboard Model S Professional

⌃ *The Das Keyboard Model S Pro may seems fairly basic, but it's perfectly engineered*

⌃ *The USB hub is a good incentive, but it's oddly placed*

If precise German engineering is a must for your peripherals, then you won't find must better than the Das Keyboard Model S Professional.

Available in a variety of layouts, it caters for both Mac and Windows users and has a selection of Cherry MX switches: blue for the clicky, noisy versions; brown for the softer, more tactile feel; and red for the quieter key models. The gold-plated switches on the MX red version we had felt good, and in all respects were really quiet, especially when compared to tapping away at a Cherry MX blue switch keyboard.

The keys are smooth and concave, decently spaced and make for an accurate and comfortable position when typing or gaming. There are multimedia control keys too, and you get full N-key rollover with the PS/2 adapter and six-key rollover through USB.

This keyboard comes with a lengthy 2m cable with a split end: one for the keyboard itself and the other to power the built-in two-port USB hub that's located on the right-hand side. This quite handy, especially if your monitor is without this feature, but placing it on the right of the keyboard is an odd decision, because the mouse (for right-handed people) can knock anything that's poking out the side. That might not

happen all the time, but we think the USB hub would have been better located at the rear of the keyboard.

The four rubberised feet around the back of the keyboard give it plenty of stability, but when you flip the support stands, there appears to be very little in contact with the surface of the desk; the result is that this keyboard does tend to skid around a bit more than normal.

There are a number of replacement keys available: the usual WASD (although this isn't really considered a gamer's keyboard), some coloured variants, replacement Windows keys and Superkey equivalents. There's also a Mac version of this keyboard, which obviously has the Mac keys laid out in whichever ways users require. Interestingly, there's also an Ultimate edition of the Model S, which has totally blank keys.

Whichever version you decide to go for, the Das Keyboard Model S Professional is a fantastic mechanical keyboard. The red MX switch version was fluid, easy to use and almost as quiet as its membrane cousins, and in general it just felt good to use.

The models do differ in cost, but they tend to average out at around the £100, which isn't too bad for a keyboard that can easily last you the life of your computer.

micro mart

7 Quality
6 Value
7 Overall

Tesoro Durandal G1N

Tesoro is quite famous in the industry for giving its products some interesting names. In this case Durandal is the sword of Charlemagne's paladin Roland. The sword is said to contain within its golden hilt one tooth of Saint Peter, blood of Saint Basil, hair of Saint Denis and a piece of the raiment of the Blessed Virgin Mary. As far as we know, the G1N contains none of those items.

This is a Cherry MX Brown switch keyboard, with a good tactile, semi-silent and soft feel to the keys. It features full N-key rollover through the USB-to-PS/2 passive adapter, six-key rollover through the default USB cable, a selection of multimedia keys and an included wrist rest.

The build quality of the Durandal is really very good. It has a kind of brushed aluminium look to it, and although it isn't metal, it does make it look more expansive than it actually is. Looks aside, it's also decently weighted and feels like it'll withstand both the continual onslaught of gamers and heavy typists. Whether it'll possesses its namesake's durability is debatable, but it doesn't feel bad at all, and we'd be willing to bet it will stand the test of time.

The keys are well spaced on the board, so movement when typing is fluid, and it keeps any mistypes to an absolute

▲ *The Tesoro Durandal G1N certainly looks imposing*

◄ *Sadly, Saint Peter's teeth aren't included*

> 66 **Whether it'll possesses its namesake's durability is debatable** 99

minimum. It's also good to see that despite being gaming keyboard, it's not obvious that it's a gaming keyboard. If you were to compare it to the Logitech G710+, it would be obvious to the viewer which of the two is destined to adorn the desks of gamers. Apart from the angled section in the upper right of the keyboard (which is where the USB hub

would exist had this been the big brother, the Ultimate Gaming version), there's little to distract casual users from their daily duties.

Being a 'without-gimmick' gaming keyboard also means the price has been cut somewhat. In fact, in terms of price, the Durandal comes in at around £65, which is impressive for a mechanical keyboard.

That said, you are missing out on backlit keys and other such features, but what you get is a keyboard that performs and feels as good as, if not better, than what's on offer from some of the leading names in the mechanical keyboard industry.

To conclude, the Tesoro Durandal G1N may not be all singing and all dancing, but in terms of sheer value for money, durability, looks and feel, it's one of the best budget mechanical keyboards we've sampled in a long time.

micro mart
7 Quality
8 Value
7 Overall

Mechanical Keyboards

Tesoro Lobera Supreme

Mechanical keyboards are well renowned for giving gamers the best possible feel, longevity and response. Together with the clicky, tactile key press, mechanical gaming keyboards often offer a host of tantalising extras too.

The Tesoro Lobera Supreme mechanical gaming keyboard is designed as a gamer's dream peripheral. With a choice of either Blue, Brown, Black or Red Cherry MX Switches, each with a 45g actuation force and 2mm of travel, there's a high degree of responsiveness and technical quality on show, before you even start to focus on the aesthetics.

Each key is laser etched with multimedia capabilities that you access with the FN key, which also doubles up to include the hardware controls for the keyboard illumination and macro assignments. It has a 1.5 meter braided USB cable, which is double ended to allow the built-in two-port USB 2.0 hub to be powered, and it also includes a passthrough for both the headphone and microphone ports.

You also get a powered hub USB cable, which will increase the power to the built-in hub to a maximum of around 100mA. It's enough to power some of the more exotic headsets and in some cases older phones.

The Lobera offers full keyboard key programming (except for the Escape, F1 to F12 and Windows keys), as well as

▲ The Tesoro Lobera – or Wolfslayer as it's also known

◄ The additional USB hub is handy

> **" It's surprisingly comfortable despite the military combat design "**

five distinct profiles and three macro thumb keys. This brings the total of macro programmable keys to 300, across any number of games you can assign them to. And if that wasn't enough, there's a full-colour key backlight that can be set to six different levels depending on your preference.

In terms of design, the Lobera is all about toughness, and its

robust exterior includes a steel plate facade across the bottom of the keyboard, together with Allen key access in the corners. The backlight glows along the sides as well, which gives it a rather sleek look. You could claim it was well and truly over the top, but it works well.

The keyboard itself measures 500 x 185 x 38mm and weighs a considerable 1.71kg, which in our

view makes for an excellent and study base. The large rubberised feet stop it from moving around your desk when under gaming pressure, and its hard as nails construction means it'll take whatever you can throw at it.

Of course, on-paper specifications are one thing; actually using the product is something else entirely. The Lobera Supreme (which incidentally means Wolfslayer, the legendary sword of power used by Saint Ferdinand III) is an extremely capable keyboard. It's surprisingly comfortable despite the military combat design, and it offers gamers incredible control over their environment.

micro mart

7 Quality
8 Value

8 Overall

Logitech G710+

Although it's now a few years old, the Logitech G710+ is still worth considering.

Logitech has been knocking out keyboards for years, but the company is known more for its membrane models than its mechanical models.

The G710+ is has Cherry MX Brown switches, which feels pretty good when gaming on. Of course, the gaming generally only uses a handful of keys (mainly WASD), and when used in that capacity the G710+ does a decent job. When used for typing, though, the keyboard can feel a little cluttered and there are more mistypes than there really should be.

The G710+ features a detachable wrist rest, six programmable G-Keys with up to three macros per key (giving a total of 18 individual functions per game) and a Game mode switch that disables the Windows key in case you knock it when gaming. A collection of media keys sit at the top of the keyboard, and a volume control roller is located above the numpad. It also has a backlight with to four brightness levels and individual lighting up of the WASD and arrow keys – all in a fairly sterile white colour.

While the other keyboards on test generally feel very well built and designed, the G710+ feels less like a mechanical keyboard and more like one of the many faceless gaming membranes that are available for a fraction

The Logitech G710+ may be older than the other models, but it has lots to offer

It's still a great gaming keyboard

> **" It's reliable, has tons of features and it's comfortable to use "**

of the cost. It's not all bad, however, and although it may lack the rugged looks that the Tesoro examples feature, the G710+ could easily stand toe to toe with them and take just as much punishment.

Thanks to the special macro record key and the Logitech software, you can start building a macro profile for a particular game in no time at all. Also, the included software comes with a selection of pre-programmed macros for over 250 popular games, so you're bound to find something you play in there.

Despite being a little older than some of the other mechanical keyboards around, the Logitech G710+ is still a solid product. It's reliable, has tons of features and, more importantly, it's comfortable to use – even if you do occasionally hit the wrong key due to the sheer number of them.

For around £75, the Logitech is a good buy, but the Tesoro Durandal is slightly cheaper. However, what the Logitech may lack in rugged looks and so on, it certainly makes up for in features. And for that price alone, it's still well worth looking into.

micro mart
8 Quality
8 Value
8 Overall

Mechanical Keyboards

Cherry MX.Board 3.0

Having a group test without at least one example from Cherry would be criminal, so we got ourselves a Cherry MX.Board 3.0, which could well be only keyboard you'll ever need.

The MX.Board 3.0 has a variety of coloured switches to choose from: Black, Brown, Blue and Red, which is what we were using for this review. The Red MX switches offer a low actuation force and quieter typing feel.

There's a classic Cherry-look to the keyboard, but this particular model has a far more slimline design. It has a small footprint of 446 x 158 x 28mm and weighs around 830g. It has a compact look that's not too far off a decent full-sized laptop layout, but the keys are well spaced, and using it feels comfortable and fluid.

It's certainly robust enough, with a metal plate on its base giving it enough weight and rigidity to take some

⌃ *It's small, priced well and works like a dream. What's not to like?*

⌃ *Although simplistic in design, the Cherry MX.Board 3.0 is exceptionally engineered*

punishment, should you be a little heavy-handed when it comes to typing or gaming.

The detachable 1.8m mini-USB cable is a good idea; that way the cable can easily be replaced should either end ever be damaged. And with the package you also get two large triangular rubber strips to stick to the bottom of the keyboard and a couple of rubber feet to fit over the flip-out stands. Whichever way you look at it, with both

rubber additions in place, the MX.Board 3.0 isn't going to slide around on your desk.

Despite the MX.Board 3.0 lacking any programmable keys, profile options, back lighting effects or other such wonderful features, it isn't lacking in technology. Under the hood, as the saying goes, there's a lot going on, in the form of Cherry Gold Crosspoint Technology – whereby an electrical charge is made of two gold contacts in a crosswire setup, which is said to greatly improve the speed of the contact, lifespan of the contact and actuation force.

This means that the keys on this particular model are designed with a 50 million operation lifespan. In addition to this, you get N-key rollover and simultaneous operation of up to 14 keys without any ghosting effects. This is German keyboard engineering at its best.

Of course it's the 'feel' of the keyboard that makes it worth

buying, rather than the level of technology used. Thankfully, Cherry has managed to keep its classic 'feel', so the MX.Board is one of the most comfortable we've ever used.

It's certainly smaller than the other examples we've had so far, and we're used to keyboards taking up a bit more space, with things like wrist rests and so on. But despite its size, we really liked the Cherry MX.Board 3.0, and considering it only costs around £65, we're suitably impressed.

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9 Quality

8 Value

9 Overall

Roccat Ryos MK FX

Roccat's keyboard series consists of the Sova, Arvo, Isku and Ryos. Each series has several sub-models on offer, with each bearing a slightly different feature or subtle alteration in design. This alone gives Roccat the edge over most of the competition, as it's never offering just one model for the user. There's plenty to choose from, especially with the Ryos series.

The MX FX is the newest entry for the popular gaming mechanical Ryos series. As Roccat states, it's "the perfect weapon to add to your gaming arsenal" – a statement that isn't too far from the truth.

The Ryos MK FX offers RGB per-key illumination, which, when coupled with the Roccat Swarm software, offers up to 16.8 million possible colour combinations. If that's not impressive enough, there are also a pair of 32-bit ARM Cortex processors and 2MB of flash memory to store profiles and customised key configurations on. You'll also find microphone and headphone ports, but sadly no USB hub.

The Cherry MX Brown keys are a little noisier than their Red counterparts, but they feel good to use and come with the same 50 million keystroke rating as any other Cherry MX switch keyboards.

The Ryos Mk FX is a reasonably large and hefty keyboard, measuring 508 x 234 x 44mm and weighing a considerable 1.6kg. The long two-metre braided dual-ended USB, heaphone and microphone cable is quite thick too, and could be a little awkward to fit down a crowded desk cable tidy hole. But everything is built to an exceptional standard. Plus there are little design extras to consider such as a smudge-proof glossy coating, large non-slip pads fitted to the bottom of the keyboard and a large, rubber-feel wrist rest.

The Roccat Swarm software is also a great addition to the keyboard. With it you can cross-configure your Roccat peripherals (mice and keyboards, headsets and so on) to work with a particular game in conjunction. If, for example, you're working on an MMO, you can cross-configure special keys and mouse buttons, save the profile for both keyboards and mice and load them back up again for when next in the game. It can take time to set up, but once in place, it's a powerful feature.

It's this level of customisation that makes the Ryos MK FX more of an impressive keyboard than the others we've looked at here. While most of the other examples have programmable

⌃ The Roccat Ryos MK FX is an exceptional mechanical keyboard

⌃ It's a gamer's dream come true and impressive in every way

keys and such, this has an extra layer of customisation, and it seems easier to accomplish and activate.

Finally, the feel of the Ryos is superb. The keys are spaced well and it's accurate to use. It's certainly a comfortable keyboard to use on a daily basis and for some hours per day too.

It is, however, the most expensive of the group; at £140 it's a good £40 more than the DAS keyboard. However, we think it's worth every penny, and it's certainly the best mechanical keyboard we've used in a long time.

micro mart
Quality **9**
Value **8**
9 Overall

Roccat Ryos MK FX

Okay, the Roccat Ryos MK FX is the most expensive mechanical keyboard on test, but it's really one of the best we've ever laid our chubby digits on in a long time.

There's just about everything you could want – minus a USB hub – and it performs magnificently too. As we said, worth every penny.

Cherry MX.Board 3.0

The Cherry MX.Board 3.0 is a splendid mechanical keyboard. It doesn't have all the bells and whistles of a gaming keyboard, but for the non-gamers it's ideal. Plus it's compact and superbly engineered.

How We Tested

Each keyboard was tested on a standard PC running Windows 10 Home 64-bit. Both the USB and PS/2 key rollover functions were tested and we even managed to get away with a bit of gaming without the editor realising what we were up to.

	Das Keyboard Model S Pro	Tesoro Durandal G1N	Tesoro Lobera Supreme	Logitech G710+	Cherry MX.Board 3.0	Roccat Ryos MK FX
Price	£100	£65	£90	£75	£65	£140
MX Switch Type	Blue, Red, Brown	Brown	Blue, Brown, Black, Red	Brown	Blue, Brown, Black, Red	Brown
Key Rollover	N-key, six-key	N-key, six-key	N-key, six-key	N-key, 26-key	N-key, 14-Key	N-key, 30-key plus eight modifier keys
Backlit	No	No	Yes	Yes	No	Yes
Dimensions	450 x 165 x 25.4mm	444 x 206 x 44mm	500 x 185 x 38mm	525.78 x 228.6 x 60mm	446 x 158 x 28mm	508 x 234 x 44mm
Weight	1.36kg	1.56kg	1.71kg	2.17kg	830g	1.6kg

Top 5 Google Things

It might not like paying tax, but it's not all bad

1 Search

Thanks to its enormous success, Google Search is something most of us take for granted. Like Hoover or Sellotape, its name has become synonymous with an action or product, but unlike those other examples, when most people Google something, they actually do use Google Search.

There are still plenty of other search engines, including Microsoft Bing and DuckDuckGo, and in some ways they're better than Google. But back when we were still using Lycos, Yahoo, AltaVista and Ask Jeeves, it was Google that stood out with its simple but effective approach to search. Who could possibly complain about that?
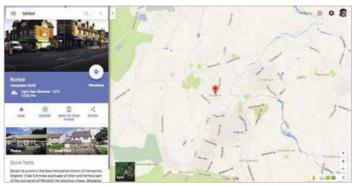
2 Docs, Sheets and Slides

Now part of the Google Drive experience, the company's online office suite gets more and capable as time passes and as Google adds more functionality. Not only do these apps offer perfectly competent word processing, spreadsheet and presentation features, everything can be synchronised with locally stored files, just like with Dropbox.

Best of all, it will cost you nothing (other than your personal data, of course). The applications don't have the depth that you might find in, say, Microsoft Office of LibreOffice, but if you're after convenience and an easy backup solution, then you could certainly do worse.

3 Android

When Apple released the iPhone, the reasons for its success were abundantly clear. It wasn't the first smartphone, but unlike those based on the Windows Mobile or Symbian operating systems, it offered what users actually wanted, rather than what the developers felt like creating.

Competition, though, is always healthy, so when Android came along, it finally felt like someone could challenge Apple's dominance of the smartphone market. It didn't happen immediately, of course, but today Android is by far the most popular operating system for mobile devices, including tablets. It's not perfect, but it has enabled even cheap phones to have smart features – something we can all be grateful for.

⌃ *Where it all began for one member of the Micro Mart team…*

4 Maps & Earth

Although it's probably not popular with satnav manufacturers, consumers have benefitted massively from Google's mapping products. Google Maps, combined with smartphone GPS systems, has made navigation technology accessible to practically everyone, and the online nature of the service means the maps are nearly always up to date.

Google Earth, meanwhile, presents much of the same data as the Maps service, but the presentation is what makes it really special. Being able to spin round a virtual globe and zoom in to see satellite photography of your chosen location is truly magical. And the fact the app runs on mobile phones is even more remarkable.

5 Doodles

Having great products and knowing how to avoid the tax man aren't the only reasons that Google has grown so huge. Part of its appeal is undoubtedly the fact it remains 'cool'. As the owner of YouTube, there's no doubt that young people are happy to engage with Google every day, but for us some of the coolest things about Google are its regular logo designs, which replace its standard logo.

Not only do these logos present interesting images, they also often get us to read about things we wouldn't normally read about. But most important of all, they give the company a sense of fun. Cynics might suggest this is all part of the company's branding and profit-making, but long may it continue, we say.

Can You Build A Completely Wireless PC?

James Hunt looks at whether we'll ever be able to completely cut the cords

I f you were compiling a list of the most transformative developments in home computing over the last decade, it's a safe bet that the invention of wireless communications would be somewhere near the top. By eliminating cables, wi-fi in particular made getting online convenient and simple. Most of us would no sooner go back to a wired network than we would start doing our laundry with a washboard and mangle. There's no disputing that wireless was the future of networking. But is it the future of all computing?

You only have to look at your desktop PC to see that there are still improvements to be made. If you put a system into the centre of a room and spread its peripherals out around it, you'd probably have something that resembled a spider-diagram of itself. Accessories are tethered to your PC and to the wall – and sometimes to both at the same time.

It begs the question: if wireless networking has been such a success, would it be possible for a desktop PC to become completely cable-free? Faced with that sort of question, we couldn't help but try to find out.

Wireless Keyboards
Price Range: £8-£80
Top Manufacturers: Microsoft, Logitech

Why Wireless? A wireless keyboard can free you from your desk chair, acting as a remote control for media on your PC, HTPC or smart TV, and it can allow you to type from any position you like. And if you're just on your desktop, it looks a lot neater!

How To Choose: Keyboards are among the cheapest peripherals you can buy for a PC, but they're also the one you're likely to use the most. For that reason, it's worth paying a little extra for a decent one.

Admittedly, it might be hard to psychologically justify the leap in price from a sub-£5 basic wired model to the slightly more complicated wireless keyboards, but it's worth splashing out for extra features that'll make the most of wireless controls, such as a volume sliders or media buttons.

If you're not looking to use it on your desktop, we'd suggest getting one that uses Bluetooth rather than wireless radio or infra-red, because that'll make it compatible with a huge variety of devices – not just your PC, but your laptop, phone, tablet and more. But on with a desktop PC, a radio signal is easier: there's no pairing involved; it's just plug and play.

Suggested Model: The Microsoft All-In-One Media Keyboard retails for £30.99, but can be picked up for less than £25. It has a huge multi-touch touchpad and a variety of extra programmable keys, in addition to media features, giving you plenty of scope to customise your use of it. The keyboard takes two batteries and has a battery life indicator to help you keep track of how soon you'll need to buy replacements. The wireless connection is radio-based, meaning you can hide the receiver out of the way and still get a decent connection from anywhere in the same room.

Wireless Mice
Price Range: £5-£75
Top Manufacturers: Microsoft, Logitech

Why Wireless? You probably know why. Wired mice have cables that can get tangled, twisted and snagged from their frequent movements. It's not a problem when you're only moving your mouse within the same 3" radius as normal, but as soon as you want to move beyond that, you'll struggle. Wireless mice are especially good for notebook PCs, where typical mouse cables are so long they inevitably get in the way.

How To Choose: As with keyboards, a good mouse is essential to establishing a smooth interface with your PC. Really, you should

expect at least four buttons and a scrollwheel. Because wireless mice have batteries in them, they're usually a little heavier than wired ones, so it's worth testing the weight first to see how comfortable you are with them.

Suggested Model: The Logitech Wireless M525 has a £35 retail price but again can be found for cheaper prices without much trouble. Rather than separate buttons on the side, it has a scrollwheel rocker that can be used to navigate back and forward, which makes it easier to use if you're left-handed. It's a comfortable shape and about as light as you can get for a device lugging two AA batteries around. The wireless technology is RF, giving you a decent two- or three-metre range, but it uses Logitech's universal wireless receiver, so if you have other compatible hardware, you only need one for up to six devices.

Perhaps best, though? It has three full years of battery life for the average user. If that's even half-true, then you couldn't ask for better performance.

Wireless Display
Price Range: £35-£200
Top Manufacturers: Microsoft

Why Wireless? Paired up with a wireless keyboard, mouse and speakers, a wireless monitor would mean you could put your workstation pretty much anywhere you liked (range-permitting), giving you all the power and flexibility of a desktop with the domestic portability of a laptop. It's not quite as portable, admittedly, but if there's a nook you want to hide your base unit

away in, or if you want to move your workstation from room to room, it opens up those possibilities.

How To Choose: Sadly, the high data requirements of a video connection combined with the latency inherent in wireless connections makes the reality of wireless monitors less than impressive. Wireless monitors do exist, but they are often disproportionately weaker than similarly priced wired models.

What you can do is pair a good monitor with a wireless HDMI adaptor. Make sure it supports 1080p and has a low latency, and you'll be able to use it with any HDMI-compatible display over a huge range.

An alternative might be something like a Miracast adaptor, which uses a network signal to mirror your screen output – though you'll probably need a screen physically connected to your system to activate it. For a true wireless connection, you need cable-replacement technology, and that's expensive.

Suggested Model: The Acer MWiHD1 retails for £160 and uses a 60GHz wireless connection to give interference-free wireless HDMI transfer. Designed for use with projectors, it's compatible with any HDMI input. All it needs is an HDMI out and an HDMI in to connect the two parts to, and your cables are a thing of the past. It supports 1080p, 60fps and Blu-ray 3D at 4GB/s without compression. You will need an HDMI port that's MHL compatible to use it, though, so check before spending any money!

Wireless Speakers
Price Range: £12-£280
Top Manufacturers: Creative

Why Wireless? In a world where your computer is capable of surround sound, nothing spoils the illusion quite like having wires trailing around the floor – to say nothing of the potential damage (or injury!) you could cause by tripping over them. Alternatively, wireless speakers with good enough range will allow you to pipe music from your PC and MP3 player into any room in your house, truly liberating your music collection.

How To Choose: Whether you go for a simple single-speaker setup or a multi-speaker surround sound behemoth, the rules for choosing speakers are simple. Make sure they've got a good amplifier in them: the higher the wattage, the better the sound quality, and the louder the volume. The biggest obstacle to becoming unwired for sound is that a most wireless speakers run off Bluetooth, and even now, very few desktop PCs have Bluetooth built in. Before you buy speakers, make sure you've got a wireless audio transmission method lined up.

Suggested Model: The Creative Inspire T30 speakers are comfortably mid-range at an RRP of £99.99, and we easily found them for £79.99. Although audiophiles might want to consider some network speakers, these have a built-in tweeter and a woofer that takes up the entire rear of the speaker, allowing them to chuck out a powerful sound. The speakers have an auxiliary input in case you want to plug them into your non-Bluetooth computer or MP3 player, and AptX compatibility means that in theory the sound is as good as any wired connection.

Headsets & Headphones
Price Range: £23-£220
Top Manufacturers: Sennheiser, Sony

Why Wireless? As fond as many of us are of noise-cancelling, lightweight, space-age-material-sporting headphones, the simple truth is that wired headphones are simply inconvenient. What headphone user reading this hasn't got the cable caught in the wheels of their chair or accidentally pulled their speakers over after misjudging the amount of slack available? None, that's how many. Not only do wireless headphones get rid of that sort of inconvenience, they also let you play games or watch TV on your computer from the other side of the room. Ideal for experiencing late night movies or gaming in a way that won't wake the neighbours.

How To Choose: There's not much science to this one; just avoid getting anything you're likely to be uncomfortable

wearing. If you're serious about headphone use, noise-cancelling capabilities are a must, and gamers or Skype-users will, of course, want a built-in microphone. Headsets inevitably cost more, but as with speakers, as long as they do the job, you don't need to go wild.

Suggested Model: Unless you're committed to a super-expensive pair, we can't recommend spending more than £80 or so on a pair of headphones. Logitech's Wireless Headset H800 can be picked up for about £69.99 (it retails for £79.99) and has a 12-metre range, built-in microphone and on-ear track, volume and power controls. They have two connections: a nano receiver for a PC and Bluetooth for smartphones, tablets and other compatible devices, so it's easy to switch between them. They're also foldable for easy portability!

Wireless Printer
Price Range: £60-£200
Top Manufacturers: Epson, HP

Why Wireless? If you mostly use a laptop or tablet, you might not have a permanent workstation set up. That means you're probably already familiar with the pain of having to assemble and dissemble a printer in your living room every time you want to print something. With a wireless printer, you can stick it in a corner somewhere and print to your heart's content, with no need to lug your computer from room to room to do so. And, of course, a wireless printer can be accessed by multiple devices simultaneously, rather than the single device it's plugged into.

How To Choose: You've got a few options: a colour inkjet (or even cheap monochrome laser printer) at the very bottom end or the price spectrum, or expensive all-in-ones and colour laser printers at the other. Usual printer rules apply: laser if you're printing a lot of text, colour laser for high-quality photos, inkjet-based models for general multi-purpose use, and all-in-ones if you want faxing, scanning and photocopying into the bargain. Remember that to use the printer properly, you'll need a router too.

Recommended Model: The HP Envy 4500 is a multifunction colour inkjet with print-and-scan functionality, cloud access and USB connectivity. As a multifunction, it of course has built-in copier, scanner and fax functions, and the colour touchscreen allows you to simply access and configure its functions even without a separate device. At £46, it's not the cheapest printer on the market, but that's almost £20 off its RRP, and when cheap printers are so shoddily made anyway, it's worth spending extra money to ensure you get decent-quality hardware rather than a loss-leader designed to sell ink cartridges. **mm**

Wireless Power
It's been almost 120 years since scientist and eccentric Nikola Tesla demonstrated the wireless illumination of lighting, at the 1893 World's Columbian Exposition in Chicago, and yet the vast majority of electrical appliances we use in our homes are still, quite literally, earthed. We don't need cables to get our TV, radio, or even internet anymore, so why, when the technology is so old, do we still have power lines laid beneath every street and wires trailing over every carpet indoors?

Well, maybe we won't for much longer. It's taken a while to get started, but soon Nikola Tesla's dreams might reach fruition, and plugs and wires could be consigned to the dustbin of history alongside ruffs, Zeppelins and netbooks.

Researchers at MIT have already proposed a system that could recharge the likes of phones, MP3 players and laptops from a distance of three to five metres using a phenomenon known as 'resonance', which causes objects to vibrate when exposed to certain frequencies. Rather than using acoustic vibration (as in musical instruments), electromagnetic resonance could deliver power to devices without the need for wires.

Under normal use, electromagnetic radiation (e.g. radio waves) is unsuited for transferring power because antennas scatter the energy in all directions. However, using 'non-radiative' antennas that exhibit long-lived resonance, energy can be formed into 'tails' which fix onto other, similarly resonant objects. Energy that doesn't transfer is reabsorbed by the original source.

The technology was registered under the name 'WiTricity' and as recently as this year, car manufacturer Toyota invested in the technology. A 2009 demonstration at the TED Global Conference in Oxford showed a WiTricity unit powering a TV and three mobile phones.

Of course, you could also be using wireless power in your home now, without even realising. Although resonance is a new attempt to transfer power wirelessly, an older technique – induction – has been in practical use for decades. Simple electromagnetic induction, in which voltage is induced in one wire by the electromagnetic field of an adjacent (but non-touching) wire, is used to recharge electric toothbrushes, activate RFID chips and in electrical transformers. However, the range of induction is generally very short. While it could potentially recharge portable devices, it offers little practical value in terms of powering appliances beyond its immediate vicinity.

So what's stopping wireless energy truly taking over? In fact, there are several reasons that its time hasn't quite yet come. The first is simply a lack of research and investment. Until very recently, people simply didn't need wireless power. Only lately has it become typical for us to own a high number of portable devices that need frequent recharging. Secondly, in a world where everyone is being encouraged to save power while fuel supplies dwindle and energy prices rise, a wireless power technology that operates at 80% feels like a waste of a perfectly good 20%.

There is at least one good thing to report. Unlike wi-fi, WiTricity cannot be easily stolen, because both the target device and the power supply unit must be operating at the same frequency. So while you might still worry about your neighbour trying to hijack your broadband, at least you can be sure that they won't be able to steal your electricity too!

Pi-Top

David Briddock investigates an easy way to transform your Pi into a laptop or desktop.

The Raspberry Pi family just keeps growing and growing. Today there's the Pi Zero, the Pi 1 Model B+ and A+, the Pi Compute Module, the more powerful Pi 2 plus the recently launched and yet more powerful Pi 3 Model B.

But what if you'd like to transform your Pi into a self-contained desktop PC, or even build a portable Pi-powered laptop? One approach would be to buy a collection of Pi accessories and put them all together to create a custom all-in-one computing device. Here's what you'd need to consider.
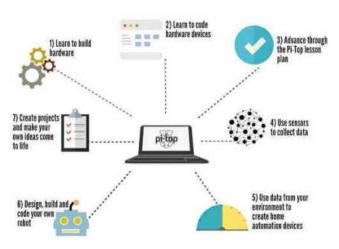
Accessorise Your Pi

From a protection point of view a case is pretty much essential. The Pibow brand (**pibow.com**) has a particularly attractive and colourful design. And the ModMyPi cases

(**goo.gl/V3780**) come in a variety of colour combinations. Some enterprising retailers have Lego-style case kits (**goo.gl/AK4gQ**) complete with raspberry logo.

As for the screen hooking up to an HDMI monitor or TV works just fine. But it's not really in the spirit of a self contained system and the cabling can look messy. A better option would be the official 7" Pi Touch Display. It's a small, high quality piece of kit where the Pi board is mounted directly onto the rear of the display.

Of course, you'll still need to find a keyboard and mouse. You may already have something suitable from an old PC. If not they aren't expensive items, nevertheless it still means searching around online websites or in high street stores to find something that you like. If you don't want to deal with yet more

▲ *Pi-Top Education*

▲ *Ceed Universe*

cables, you'll also have to invest in the more expensive wireless pieces of kit.

However, since the middle of March 2016 thanks to the Pi-Top initiative there's a visually attractive, cost effective and far more straightforward solution to owning a Pi-powered laptop or desktop.

The Pi-Top Initiative

It all started with an idea. What the Pi really needed, the Pi-Top team thought, was a streamlined purpose-built enclosure. In fact, they wanted to create two self-contained enclosures, a laptop and a desktop.

The team's search for funding, via the Indiegogo site (**goo.gl/52zi6f**), was a resounding success. By the time the contribution window closed on the 9th December 2014 it had raised $192,685, over twice the original target.

> ❝ **A full set of build instructions is included and importantly there's no soldering to do** ❞

Initially, the team designed Pi-Top products based around a Raspberry Pi Model B+ board. However, when the Pi 2 appeared it was viewed as a game changer in terms of the Pi-Top concept. With it's BCM2836 System-on-a-Chip (SoC), a quad-core ARM Cortex-A7 running at 900MHz, the Pi 2 outperformed the Model B+'s 700MHz single-core BCM2835 processor many times over. All of a sudden the team realised a Pi 2 powered Pi-Top had the power and flexibility to become an everyday computing platform.

Today the new Pi 3 makes this scenario seem even more plausible. The Pi 3 comes with a new powerful 1.2GHz Quad-Core

ARM Cortex-A53p. In practice this means it's around 10 times faster than the original Model B and quite a bit faster than the Pi 2. Mobility is also enhanced thanks to the Pi 3's built-in wi-fi capabilities, which include both 802.11 b/g/n Wireless LAN and Bluetooth 4.1 (which supports both Bluetooth Classic and Bluetooth Low Energy).

More Than A Case

The Pi-Top product revolves around an injection moulded case, so you can put the whole system together in double quick time. A full set of build instructions is included and importantly there's no soldering to do.

However, in addition to being a cool and purposeful case the Pi-Top project was designed to enhance the Pi owning experience. In particular the Pi-Top team also developed a number of educational initiatives. In particular there's an integrated gamified teaching programme, called the Ceed Universe (see image), which follows the new GCSE curriculum.

In the Ceed Universe you're challenged to collaborate with your friends to build an open world, mine resources and interact with robots. There's even an in-game nano-printer that's used to build essential tools. In the process you'll learn about hardware construction and software coding, including how to build a fully operational robot.

Online and integrated lesson plans teach Pi-Top owners how to create custom hardware by understanding electronics,

designing printed circuit boards (PCBs) and even printing 3D objects. For example, every Pi-Top kit also comes with a set of 3D printing files to fabricate your own Pi-Top case.

The team trialled the educational elements by traveling and teaching hardware innovation lessons to students around the UK. In one instance a group of students at the King Edwards school in Birmingham learnt how to create an LED circuit, write some code using a Pi-Top and go on to control a Pi-powered robot in real-time.

Pi Laptop

Let's take a look at the laptop product first. Everything is housed inside an injection moulded case. This includes the Pi 3 board itself, a LCD screen, plus a custom hub

Pi-Top Links
Home: pi-top.com
Kit: pi-top.com/#/product
Learning: pi-top.com/#/learn
Blog: blog.pi-top.com

Pi 3 Model B Specs
Broadcom BCM2837
Broadcom VideoCore IV
1.2GHz Quad-Core ARM Cortex-A53
1GB RAM LPDDR2 (900 MHz)
10/100 Ethernet
802.11 b/g/n Wireless LAN
Bluetooth 4.1 (Classic and Low Energy)
40-pin GPIO
Micro SD card slot
Micro HDMI
Analogue audio-video
Four USB 2.0 ports
Camera Serial Interface (CSI)
Display Serial Interface (DSI)

▲ *Pi-Top laptop kit*

circuit board, battery, keyboard, trackpad and associated wiring. Bright green and a more subdued dark grey seem to be the initial colour options.

With laptops two of the most important elements are the display and the battery. The screen is a generous 13.3" LCD model with a 1366 x 768 pixel resolution and 262,000 colour support. While it may have a slightly lower resolution than some other 13.3" laptop displays it's still very usable and helps keep the cost low.

Hobbyists will be interested to know there's room inside for an electronic breadboard and a few other bits and pieces. Connected to the Pi's GPIO pins this opens the door to any number of electronic projects. Putting all the bits inside the protective case keeps things tidy. More importantly the whole thing is fully portable, which makes it ideal for taking along to your local Raspberry Jam event.

As for price the Pi-Top is on sale for $300, which includes a Raspberry Pi 3, or $270 without the Pi 3.

Pi-Top Maker Experience

If you'd like to read about the real-world experience of assembling and using a Pi-Top the popular Maker website has a blog post that goes into all the details (**goo.gl/cXYrno**).

This blog post covers case assembly, cabling, boot up and setup via the custom dashboard and has a number of helpful construction images.

If you prefer a manual Pi-Top has posted a step-by-step one online at **goo.gl/fkNe3V**.

> ❝ **It's a well designed, sturdy, purposeful, value-for-money solution to a Pi-powered laptop or desktop experience** ❞

The battery is a 51.8 watt-hour pack, enhanced by software. It should provide around 10-12 hours power. The Pi 3 needs more juice to run than the Pi 2, though, so real-world tests would be helpful. The keyboard options are said to include both EU and US layouts – hopefully there'll be a UK one too. It's also fully reprogrammable via the USB interface. The pressure-clickable trackpad has a PalmCheck feature to prevent unwanted mouse activity by differentiating between finger and accidental palm touches.

The core of the Pi-Top is the hub (**pi-top. com/#/product**), a custom board that connects the power supply, screen, keyboard and trackpad with the Pi board itself via the supplied cables. It also takes care of things like screen brightness, smart power management and other functionality.

All-In-One Pi Desktop

Of course, cool as it is, not everybody needs or wants a Pi-powered laptop. However, take away the battery, remodel the case a little and you would appear to have all the ingredients for a neat little all-in-one desktop. At least that's what the Pi-Top team must have been thinking, because that's exactly what it did.

Embedded in the vertically oriented case is the same 13.3" screen, though now its viewing angle can be adjusted thanks to a lightweight stand. However, if you prefer the whole thing can be mounted on a wall. This flexibility opens up a number of intriguing possibilities for classrooms.

Once again the case is large enough to accommodate a breadboard and electronic components in addition to the hub and Pi

Official Pi Touch Screen

If it's a touch screen you're after then the official touch display from the Raspberry Pi Foundation is worth considering. It's available from a number of suppliers in a kit form, which includes these components:

- 7" Touch Display
- Adapter Board
- Adapter Board mount and screws
- Adapter Board GPIO
- jumper wires
- DSI Ribbon cable
- Perspex frame

You can find a number of step-by-step kit construction explanations online to guide you through the process. There are also a few video demonstrations too, for example Alex Eames' video at **goo.gl/QaC9Wu**.

boards. This takes us back to the classic PC era when you could lift the lid off the box and add or update various elements to enhance the computing experience.

The Pi-Top desktop has a price tag of $135 with a Raspberry Pi 3 and only $100 without the Pi. The website suggests deliveries will start in April 2016, which is around a month after the laptop device begins shipping.

Pi-Top OS

To take full control of the educational aspects the Pi-Top comes with its own Linux-based operating system. As you'd expect this ensures full compatibility with the Pi-Top hardware and so also helps guarantee a smooth out-of-the-box experience for newbies. As part of the setup you'll be invited to sign up for a Pi-Top cloud-based account. This then opens up the Ceed Universe with the teaching materials and lessons we mentioned earlier.

At this point we have to wonder why the official Raspbian Jessie operating system wouldn't work just as well? After all, there's masses of Raspbian learning materials already available, much of it highly appropriate to the UK's computing curriculum.

To be honest, the last thing teachers need is yet another operating system to factor into their lesson plans. Especially when they are already gearing up for the introduction of the BBC Micro Bit, which is designed to supplement the existing Raspberry Pi lesson content.

That said, in its native form the out-of-the-box Raspbian Jessie distribution image is unlikely to work as expected, mainly because of the custom hub board that interconnects the hardware elements. However, it should be a relatively simple task to put together a Pi-Top support Raspbian download with the necessary drivers and other software elements. And the Raspberry Pi Foundation may well include Pi-Top support in a future Raspbian release.

Kano Screen Kit

Kano Screen Kit

A recently launched alternative to the Pi-Top is the Kano Screen Kit (**uk. kano.me/products/screen-kit**). The kit comes in a sturdy box and, just like other Kano Raspberry Pi products, everything is clearly labelled. Follow along with the Lego-like assembly instructions and kit construction should only take around 10 minutes, even for the youngest Pi enthusiast.

The screen itself measures 10.1" diagonally and it's made from Gorilla Glass to protect it from knocks and scrapes. Included in the kit is a strong plastic wedge-shaped frame. This allow the screen to laid down on a table, like a tablet, or placed in an upright position, much like a traditional monitor (see image).

Fixed to the back of the screen is a dedicated driver board, which has a cable connection to the screen control board. The driver board connects to a Raspberry Pi via a conventional HDMI cable. Power is provided through a bespoke microUSB cable, which is also used to power the RaspberryPi.

With the official Raspbian Jessie distribution image the desktop should fill the whole 10.1" display area by default. If this doesn't happen with other Pi-compatible distros then there are some controls at the back of the screen which can alter the setup if needed.

Running at 1,280 x 800, which equates to 150 pixels per inch (PPI). Early reports suggest the display is bright and clear, and with such a tough case the whole setup ought to take a fair amount of punishment. Something that isn't true of other similar products. However, on the downside it lacks a dedicated audio output and the screen doesn't offer touch sensitivity.

Priced at £120 the Kano Screen Kit offers the same kind of value-for-money proposition as the PiTop desktop model. That said the screen is quite a bit smaller than the Pi-Top. Even so we could see it popping up in classrooms and after-school clubs quite soon.

⌃ *Pi-Top desktop*

In Conclusion

In an crowded Raspberry Pi accessory marketplace the Pi-Top products certainly stand out as well designed, sturdy, purposeful, value-for-money solutions equally suited to the home or the classroom. The ability to add additional electronics inside the case is definitely a cool feature. After all, how many other laptops or all-in-one desktops can offer this kind of capability?

It's unclear if the custom OS is the right approach. Maybe educational additions to the official Raspbian Jessie operating system would have been a better choice. And it would be nice to see touch screen capability at some point in the near future.

What do you think about the Pi-Top laptop and desktop products? Are these something you'd consider buying yourself? Do you think they are good value for money? We'd love to know, so get in contact. **mm**

Alphabet Pi: F

David Briddock meanders through Raspberry Pi technology from A to Z

THIS WEEK: Foundation, File system, Farnell and Forum

Foundation

Registered in the UK as an educational charity the non-profit Raspberry Pi Foundation (**raspberypi.org**) was setup to create a small, low-cost programmable computer, primarily for educational establishments.

It was founded by Eben Upton of Broadcom, Pete Lomas of Norcott Technologies and David Braben, co-author of the BBC micro game *Elite*. The stated goal is to, "Advance the education of adults and children, particularly in the field of computers, computer science and related subjects."

This team, plus a few other key individuals, were concerned about the decline in both numbers and experience of the A Level students applying to read Computer Science. Back in the 1990s most applicants were already experienced hobbyist programmers, brought up in the hands-on environment of machines like the Amiga, BBC Micro, Sinclair Spectrums and Commodore 64. The modern PC, and the office-app centric ICT curriculum, wasn't offering the same kind of interaction or experience, though.

> 66 **The office-app centric ICT curriculum, wasn't offering the same kind of interaction or experience** 99

The idea was to change this situation with the Raspberry Pi computer, and they did. Today the Pi is a global success story and used in classrooms all across the world. The Foundation trustees, a powerful mix of technology entrepreneurs and computer scientists, share a passion to enhance the educational agenda still further.

File System

The Raspbian operating system is based on Debian Linux, and its file system has evolved into a fairly complex hierarchical tree of folders and subfolders. For this reason it's important to gain a little understanding of what belongs where.

The root folder has a specific set of subfolders that contain the core Linux files. For example, the 'bin' folder contains executable programs, the 'boot' folder has bootstrapping executables and associated settings, while the 'dev' folder is the location for device driver code and configurations. For a full list of the Debian Linux root folder hierarchy visit **goo.gl/LTtH6n**.

Each user then has their own mini hierarchical folder tree. It starts from a folder contained within the 'home' root folder and named after whatever login name the user has for the system – which in Raspbian is defaulted to 'pi'. Inside this folder you'll find all your personal data files and configuration settings, some of which are stored in recognisable subfolders such as Desktop, Documents and Scratch.

Farnell

Farnell was one of the two companies selected by the Foundation to distribute the original Raspberry Pi Model B boards when they were released into the wild. Its website has a dedicated area focussed on the Pi (**uk.farnell.com/buy-raspberry-pi**), but it also sells all kinds of electronic components, kits, tools and instruments.

Farnell also has a strong and active community called Element 14 (**element14.com/community**) that provides a wealth of Pi information and tutorials. In particular they've sponsored hundreds of Ben Heck YouTube shows, which cover all sorts of Pi maker projects plus explanations of electronics, device deconstructions, game console hacks, 3D printing and much more (**goo.gl/dmSC4e**).

Forum

The Raspberry Pi Forum is the place to go to read or share news and views about all things Pi (**raspberrypi.org/forums**).

There's a number of major sections including: community news and events, how to make the most of your Pi, educational resources (for teachers, students and parents), coding languages, fun project ideas, hardware information and Pi-compatible operating systems. mm

Remembering...
Text Adventures

David Hayward goes North, West, Down, Get Sword...

Although the latest graphical masterpieces are a wonder to behold, there's a lot to be said for simply using your own imagination and playing a clever, well written text adventure game.

Text adventures were once as popular as any platformer, 3D space game or arcade conversion. There was a time when computing was pretty low on resources, even 2D colour images were difficult to squeeze on to a tape or 5¼" floppy. So the game makers of the time used a different method to get their products out to the world.

A text adventure could be about absolutely anything, that was the most endearing factor about them. You could be stuck in a haunted house, in an underground mine, on a space station, a different planet, or in the middle of the jungle surrounded by unfriendly natives and the occasional dinosaur. There was a very B-movie quality about them, which appealed greatly to those playing them.

Of course the quality of the adventure hinged on how well it was written, and how well the gamer could interact with the environment and the character they were portraying. It was a fine balancing act, and one that often fell foul to poor dialogue or even worse programming. However, there were times when everything came together perfectly.

History
According to internet legend, the first ever text adventure was *Colossal Cave Adventure*, also known simply as *Adventure*.

It was written in 1976 by Will Crowther and Don Woods for the PDP-10 mainframe, and was called an interactive fiction game. In *Adventure* you explored a cave system – allegedly set in Kentucky – to find wealth and magic. However, you came across traps, dragons and all manner of other such fantastical creatures.

Amazingly, the game was originally written with 700 lines of FORTRAN with a further 700 lines of data. In this Crowther and Woods managed to shoehorn 78 map locations, 193 vocabulary words and 12 navigation messages, with the final game taking up a whopping 300KB of memory.

From those early days, and especially through the early to mid-eighties home computer boom, the text adventure grew and began to incorporate 2D images to help emphasise the character's current location.

The Hobbit was one of more popular text adventures from the 80s, and took a lot of inspiration not only from Tolkien's tome, but also from the structure of the original *Adventure*.

Sadly the text adventure these days is limited to a layer of the internet that isn't as popular as it once was. These days, huge gigabyte sized games costing millions to develop and having very little in terms of content take the precedence over the humble text adventure. It's sad, but that's progress for you.

The Good
With some clever dialogue the only limit was your own imagination. Even with an

amateur knowledge of BASIC you could create your own text adventure. Often, some excellent mind-bending puzzles.

The Bad
Some poor text adventures would leave you in limbo, with no way to progress. Others sounded great but had a poor vocabulary and programming.
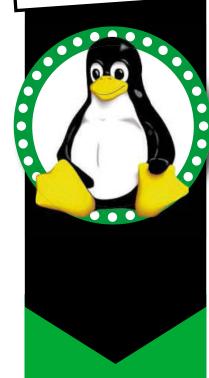
Conclusion
We had some great times with text adventures. Staying up well past our bedtimes, secretly plugging away to find the golden key to open the door to the room that contained the treasure. Great times, indeed. **mm**

Did You Know?
- Xyzzy – An original magic word created in *Adventure* to help you teleport from one location to another. Or is it? Some people claim there's a mathematical hidden message in there.
- *Colossal Cave Adventure* was also called *Advent*, due that being the name of the executable.
- *AdventureLand* by Scott Adams was the first commercial text adventure in 1978.
- Often 'Feelies' would be sold with the game, in the form of a police interview, crime scene evidence, or a strange 'Magick Glowing Stone'.

▲ *Colossal Cave Adventure, this is where it started*

▲ *The Hobbit, a well-known text adventure*

▲ *Code 7, a modern text adventure*

Linux Commands For Fun

Some rather odd but quite cool commands this week

David Hayward has been using Linux since Red Hat 2.0 in schools, businesses and at home, which either makes him very knowledgeable or a glutton for extreme punishment

Linux

The Linux terminal, command line prompt or whatever else you want to call it, is a strange, powerful and equally wonderful place to visit.

Within it, you can create a whole new distro or completely wipe out your existing one. You can hack into missile silos (if any government agencies are reading this, I've never done that) or create an elaborate and fantastic text adventure. There's more to the command line than simply configuring a file from source.

This week, I'm going to take a look at some of the more interesting commands available, and what you'll need to get them up and running.

ASCII Art

If you ever fancied having a recent picture turned into ASCII art, then asciiview could well be the command for you.

To begin with you'll need to install the following files:

    sudo apt-get install aview imagemagick

After entering your password or installing by whatever method your version of Linux uses, just run the following to your chosen image:

    asciiview image.jpg

Of course, replace 'image.jpg' with your own file name. The result is really quite impressive, as you can see from our screen shot. And if you want to save it, just press 'S'.

ASCII Banners

While we're still on ASCII, you can use Figlet to create some pretty cool ASCII banners.

First install it with:

    sudo apt-get install figlet

And enter the following to get it up and running:

    figlet Micro Mart is the king of computer mags!

From there you can output to it a text or image file of your liking.

Hello, Dave

If memories of HAL are still too raw for you, then you might want to skip this next part.

With espeak, you can make your distro say anything you'd like. For example:

    espeak "Hello Dave"

We thought it'd be interesting as a part of a script. To really put the wind up someone, you could have it say "formatting all data…" or something.

Fortunes

An old one this, but one that's still worth a giggle every so often.

In the terminal, enter:

    fortune

You'll either get back something quite profound or really daft.

Enter The Matrix

Ahh The Matrix… One of my favourite films ever. A film that spawned some of the worst sequels directed, and yet it still lies deep in the culture of all that is geeky and technology themed. David Icke even based one of his more outlandish conspiratorial theories on *The Matrix*, so it must be still worth something.

Anyway, to get a *Matrix*-like effect in the terminal, install:

    sudo apt-get install cmatrix

And once installed, enter the following to view the effect:

    cmatrix

Fake IDs

If you want to randomly generate a fake identity, for reasons we won't go into here, use Rig.

Enter the following to install it:

    sudo apt-get install rig

And when installed, type in:

    rig

You can now enjoy life as Lea McCullough of 344 Tellfly Street, Auburn, New York.

What Else?

This is just the tip of the iceberg, so we'd like to hear from you and see if you've got anything interesting, odd, quirky or just really, really strange that can be had from a simple command.

Until next time, folks.

◀ *My daughter, Hannah, as ASCII*

5 Games You (Probably) Didn't Know Were Released On The Amiga

Sven Harvey may surprise you

There were several games that finally made it to the Amiga after the mainstream games buyer had moved on to other machines, and thus, many people completely missed.

5. Myst

Several years after the original PC release, a small development team brought the game to Amiga CD-ROM. Compatible with AGA and retargetable graphics cards, the game used full 24-bit colour re-rendered versions of each scene (rendered down to HAM-8 for the AGA version, but displayed in full colour on graphics cards), making the VGA PC original look a little antiquated.

A refreshed PC version followed as an anniversary remastered release, which in turn was followed by *RealMyst*. *Myst* on Amiga CD-ROM was released in 1997, and rather self-destructingly included the *Myst* guide book in the box.

4. Star Trek: The 25th Anniversary

The 25th anniversary of *Star Trek* was 1991 (and 2016 is the 50th), but the Amiga version of *Star Trek: The 25th Anniversary* didn't emerge until 1994 (after a PC MS-DOS release in 1992), and even then was only available on floppy disk, rather than the upgraded version that had made it to PC CD-ROM by that point.

Well, I say floppy disk… You couldn't play it from floppy, as this AGA only release required a hard disk, and eight floppy disks of crunched data had to

be de-packed onto a hard disk on the A1200 or A4000... which took over an hour.

Just to add insult to injury, the engine was a port of the PC version assuming PC-a-like graphics rather than using the Amiga hardware properly. The result were sprites and mouse control that were sluggish, unless you were running something faster than the base A1200's 14MHz 68ec020 processor. The game is somewhat of a rarity.

3. Sim City 2000

Another game that ended up being a very short production run, but it almost miraculously was released on the Amiga the same year as the PC and Mac versions, having been developed at Maxis.

It must, however, have been developed on A4000/040s, because this three-disk AGA and hard disk only version was virtually unplayable on A1200s and 68030 A4000s! Actually, scratch that; it was un-runnable on A1200HDs as it needed 4MB of RAM. I'm amazed Amiga Technologies didn't try to license it to be pre-installed on vanilla AT A1200HDs.

2. Putty Squad

System 3 got review copies of the game out to the major magazines, with reviews (fantastic ones too, including an Amiga Format Gold) being published in time for the game's retail release in 1994. However, a retail release of this Amiga 1200 title never actually happened.

The game was eventually released to the public on

Christmas Eve... 2013, and as a free to download promotion from System 3 itself, following a reconstruction of the code/disks by Phill Boag-Butcher (aka Galahad/FLT.) There was a version actually produced on floppy disks and released as a boxed game as a reward for Bitmap Book's *Commodore Amiga – A Visual Compendium book* Kickstarter campaign.

1. WipEout 2097

WipEout may well have been a PlayStation brand from day one in the UK, but the links back to the Amiga were strong, and it seemed rather cathartic that Blittersoft managed to license the second game in the series and port it to PowerPC upgraded Amigas (and quite how that was viable was another question entirely). Okay, it was some time after the 1996 release of 2097 on the PlayStation and 1997 release on Windows CD-ROM, but the 1999 PPC Amiga CD release improved on the graphics of the PC version and allowed the game to run in a window on Workbench, while retaining the CoLD StoRAGE soundtrack from the Mac and PC versions. On a good enough machine, it's a dream to play – assuming you can convince those around you of its existence!

Sven Harvey has been our Amiga specialist for over 16 years, drawing on his 25 years retailing computer and video games and even longer writing about them

Amiga

Are You Looking At Mii?

Ian McGurren has the weather report from the Underworld

Mobile

Ian McGurren is a professional IT analyst, a semi-professional writer and a pretty amateur electronic musician. He likes gadgetry and loves making gadgets do things they were never designed to do

Beelzebub isn't happy. In fact, he's cold. Not since 2005, when Apple switched to Intel x86 CPUs, has he been this cold. What appears to be causing this freezing in hell? That'll be the release of a Nintendo game on a non-Nintendo platform – and not any platform, but two mobile platforms. It truly is the end of days, if you're to believe the gaming press.

Now there's no doubting the significance of this release. In the big picture, it shows Nintendo has at least removed its technological blinkers for once and taken note of the rest of the planet having adopted mobile platforms for gaming some time ago. But the game isn't really going to threaten either Nintendo's business nor the business of those in the mobile gaming industry. In fact, to call it a game is… stretching it, certainly.

So if it isn't a game, what exactly is Miitomo? Well, in five words: quirky, social, sims, Japanese, Pachinko. Miitomo is pretty much a cross between Mii Plaza on the 3DS, *The Sims* and the lobby of most online games. There's no game as such, more an app that has a Mii creation and dressing-up section, a social Q & A section (with said Miis) and a strange Pachinko game (think Peggle and the 2p machines at the seaside) that's the closest thing to a game the app has.

Download the app, sign into your Nintendo account (you'll need one) and let the app create a Mii from taking a picture of your face. Somewhat oddly, you don't appear to be able to use any Mii you have connected to your account, such as one on a Wii. After this, you get to dress your Mii up in all sorts of clothing, including some odd stuff (a hot dog outfit? Fishnet stockings?), select its voice and a few phrases you can customise for greetings and such and finally take a picture of it in one of many fun / dumb / saucy poses.

You're then somewhat left to your own devices, with your Mii wandering round its little room like a nervous prisoner in solitary confinement. The room isn't interactive either. But wait, there is a social aspect! This comes from hooking up with other Miitomo users and visiting their own little rooms and both of you exchanging answers to set questions, to much mirth, I have no doubt. For this, you are awarded gifts and tokens, which you can use to buy more clothes or spend on the Miitomo Drop game!

Ahh yes, the game or the 'fun', if you will, because unlike the rest of Miitomo, this is comparatively fun. Essentially a Pachinko game to win more clothes (mostly exclusive ones), you drop your ball from the top of the screen, it bounces off of pins and bumpers like pinball, and eventually it lands on either a prize or some sweets. It's quite fun to play, even with it mostly being down to chance, and it can only be played two or three times due to the in-game cost.

And that's pretty much it. Miitomo feels a bit like a part of the OS for a Wii U or 3DS, where you make a Mii and it introduces the social and connected aspect of the hardware, and there's a sneaky feeling it may well appear again in some form on the next-gen Nintendo hardware. For its faults (that mostly being it's a bit dull), it does actually feel like 'proper' Nintendo software and not a poor attempt like some before it (cough Sony cough). Whether it's the start of something bigger or just a toe in the water from Kyoto isn't clear, but you could do no worse than wasting an hour or two on the curio that is Miitomo.

![Miitomo logo with Mii characters]

Sounds Like Simplicity

Music playback technology has never been so versatile, as Andrew Unsworth muses

Given the ease of use and immense convenience of audio-streaming, I'm surprised more people don't do it. By more people, I mean those who wouldn't refer to themselves as 'tech-savvy' or particularly interested in technology. These are exactly the kind of people who would benefit most from an audio-streamer, as the interaction with modern technology is minimal, and it requires little more than taking their phone out of their pocket.

Looking on the bright side, everything becomes mainstream eventually, and in the last decade we've seen online shopping become as accepted a practice as popping into the corner shop. More recently, downloading and streaming movies has become more widespread and normal too, with even my parents downloading shows to watch, albeit by asking my sister to do it for them.

One company that might help make audio streamers more popular with a mainstream audience is One For All, a company that is more famous for making third-party remote controls. This month, the company has released two audio-streamers, the SV1810 and the SV1820.

These audio-streamers let users stream audio from a Bluetooth device, such as a mobile phone, tablet or laptop computer, to the 3.5mm auxiliary input of an existing hi-fi or music system. This means the SV1810 and SV1820 can turn an ordinary hi-fi into a smart hi-fi in much the same way that a Roku box can turn an ordinary TV into a smart TV. This saves you money, because you don't have to buy a new hi-fi – something that's even more important if you have a hi-fi system that puts many modern speaker systems to shame.

Going purely off specs, the 1820 doesn't appear to sacrifice sound quality either, as it uses a Wolfson digital-to-analogue convertor (DAC) to turn streamed zeroes and ones into something you can hear. It's also compatible with the AptX Bluetooth audio streaming codec (**www.aptx.com**), which helps to preserve the fidelity of audio streamed over a Bluetooth connection.
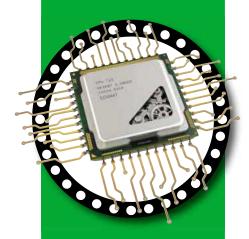
The One For All devices aren't revolutionary, and over the last few years we've seen other devices that work the same way, such as the Arcam miniBlink (**www.arcam.co.uk/mini.htm**), which is currently my favourite device of this type. However, what the One For All devices do have in their favour is a low price that invites an impulse purchase. At the moment, the devices are available for sale at One For All's website and Amazon, but if they find themselves on sale on supermarket shelves and in high-street stores, they'll also be more likely to be adopted by those who would otherwise be unaware of audio streaming.

The SV1810 is less than £30, making it cheaper than a night out or, if you live in or around our nation's capital, the price of a takeaway. To avail yourself of an SV1810 or SV1820 via One For All's website, point your browser to **tinyurl.com/jqegl3q**.

For those who don't have a hi-fi and don't want to spend a lot on a traditional hi-fi with smart features, a neat and convenient solution is to buy a soundbar. These are designed for use with a TV but are just as good a means of listening to music or audiobooks, especially if you buy one that comes with a subwoofer. Many soundbars provide the ability to receive streamed Bluetooth audio, making them a convenient and compact alternative to the traditional hi-fi. Some also support Wi-Fi Direct or streaming over a local area network, which adds even greater convenience. Thanks to modern technology, enjoying music has never been easier.

Andrew Unsworth has been writing about technology for several years, he's handy with a spanner and his handshaking skills are second to none

Hardware

Chinese Whispers

The uniquely atmospheric Everybody's Gone To The Rapture is finally coming to PC, while developer The Chinese Room has an isometric RPG on the way. Hurrah!
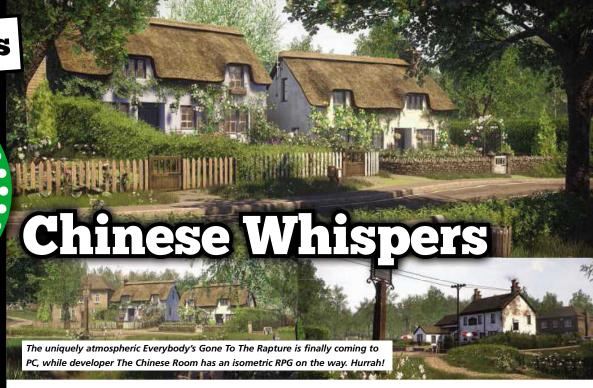
Ryan Lambie has loved videogames since he first stared up in awe at a *Galaxian* arcade cabinet in his local chip shop. 28 years on, Ryan writes about gaming for Micro Mart. He's still addicted to chips and still useless at *Galaxian*

Gaming

This week, Ryan takes a look at The Chinese Room's unique adventure games, and checks out the gigantic war still raging in EVE Online...

Plug & Play

Some games don't exist to be beaten, but to be experienced. This is certainly the case with the output we've already seen from The Chinese Room, a studio which, with its 2008 game *Dear Esther*, pretty much invented what's now widely termed the 'walking simulator'. With no weapons or imminent threat of death, *Dear Esther* was instead a game about atmosphere and telling a story through simple interactions. The player roams an abandoned island pregnant with mystery, occasionally stumbling on the fragments of old letters which slowly build up the sorry history of the place's inhabitants. Some critics were bewitched by *Dear Esther*'s melancholy tone; others were frustrated by its lack of interactivity.

Yet *Dear Esther* has proved to be highly influential, with echoes of it easy to see in such games as *Gone Home* and *Firewatch*. The Chinese Room's continued to plough its own furrow ever since, with the simple yet terrifyingly effective horror adventure *Amnesia: A Machine For Pigs* and, most recently, *Everybody's Gone To The Rapture*. The latter was first released for the PlayStation 4 in August 2015 as a timed exclusive, but The

Chinese Room have recently reassured us that, yes, a PC version is still happening.

"We started work on it in September and submitted it recently," writer-designer Dan Pinchbeck told *Rock Paper Shotgun*. "Sony will be handling the PC release, including management of the Steam page and whatever else there might be, so it should be released as soon as they've done testing and preparation."

Like *Dear Esther* and *A Machine For Pigs*, *Everybody's Gone To The Rapture* is another game about combing a landscape for clues. What's interesting about this latest offering. though, is how different it is in tone from those other two; taking inspiration from John Wyndham's classic novel *The Midwich Cuckoos*, *Rapture*'s set in a traditional English village where something extraordinary has happened. The entire population has vanished, and it's up to the player to find the truth. Less funereal than *Dear Esther,* and less horrifying than *A Machine For Pigs*, *Rapture* has its own disquieting air of the uncanny.

While we'll have to wait for a firm release date for *Rapture*, The Chinese Room is already well into the process of making its next game, *Total Dark* – a project that

is markedly different from the studio's earlier output.

"It's a much more traditional game," says Pinchbeck, "an isometric adventure with a free-floating camera and lots of mechanics. That will make some people happy while other people are going to wonder if we have the right experience to make that sort of game. But we absolutely do."

Pinchbeck has cited pen-and-paper RPGs like *Traveller* and *Paranoia* as influences on Total Dark. While specifics are still scarce, with a working prototype apparently nearly finished, we should be hearing lots more about it very soon. Until then, all The Chinese Room will say is that it will be a "lighter" experience than its last three games, but "no less weird". We can't wait.

Online

Compared to some MMOs, *EVE Online* doesn't have a massive following, but the stories that come out of it are mind-blowing. A recent example: thousands of its players are currently locked in a gigantic galactic war. According to developer CCP, some 60,000 EVE players mobilised against each other on the 28th March, making it the biggest conflict in the game's history.

▲ *Around 60,000 players are currently locked in a massive conflict in EVE Online, making it the biggest galactic war in the game's 13-year history*

The reason for the war? Without getting too bogged down in the game's soap-opera-like history, the fight began when disparate groups of players clubbed together to fight the game's largest coalition, which calls itself the Imperium. That coalition, led by Alex "The Mittani" Gianturco, has managed to hold a huge sway over the game by effectively running a protection racket – "Bend the knee and enjoy the benefits of the Imperium," the empire's website reads, "or be replaced with somebody who will."

Needless to say, players who weren't part of that coalition grew increasingly disgruntled about it all, and the anger eventually came to a head when an online casino called I Want ISK – where *EVE* Players can gamble their in-game currency on virtual slot machines – decided to bankroll a group of rival players. Calling itself the Moneybadger Coalition, the group's aim is to bring the Imperium's age of tyranny to an end.

At the time of writing, the huge battle is still raging; the Imperium, a group once considered to be so large as to be unassailable, has found itself locked in a battle which, according to developer CCP, could continue to rage on for months. In terms of destruction, this current conflict hasn't yet surpassed the 21-hour battle that unfolded in 2014, since dubbed the Bloodbath of B-R5RB, which resulted in the destruction 75 Titans – the largest class of ship in the game –and hundreds of Dreadnaughts and Carriers. Bearing in mind that all of those ships can take months and

millions of ISK to build, the cost of the war was huge; CCP's data suggests that the economic damage amounted to 11 trillion ISK, or somewhere north of £210,000 in old money.

The current war, the Battle of M-OEE8, hasn't reached such costly levels at yet, but CCP itself admits that it can't predict how or when the drama will end; "History is still being written, the studio writes on the game's website. *EVE Online* may be dismissed as sci-fi accountancy software by some, but as this latest episode proves, some of the game's events wouldn't look out of place in a *Star Wars* sequel.

Incoming

It's probably fair to say that id Software's *Doom* reboot hasn't had the easiest path to release.

You may remember that an entire project, called *Doom 4*, was originally announced back in 2008 but eventually cancelled three years later. According to id's Tim Willits, *Doom 4* "did not have the spirit, it did not have the soul."

As a result, id bravely scrapped everything and started again from scratch, aiming instead to recapture the wild pace and simplicity of the 90s original. If you're familiar with *Doom*, you'll know what to expect from the reboot: huge guns, even bigger monsters, and copious gore. Doom may be going back to basics, but can the game reclaim the series' past glories after its extended stay in development hell? We'll have to wait and see.

Doom is out on the 13th May.

▲ *After years in development, id Software's long-awaited Doom reboot is finally about to be unleashed. Here's hoping it revives the frantic blasting of the original in style*

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PC Repair

My system is no longer working as I get an error message when I try to boot into Windows. The error message, which appears on a blue screen, is as follows:

Your PC needs to be repaired error code: 0xc000000f

This happens whenever I try to start up my PC, and as I can't even get into Windows I'm really not sure what I can do. I've never seen an error like this before, and I'm worried that it's a really serious issue that can't be fixed.

Can you suggest anything that may help, or at least confirm the error as a major issues. At least I'll know where I stand if that's the case.

Dean

Blue screen errors are a worry whenever they turn up, especially as their appearance is usually accompanied by an unbootable, unusable PC. Most other errors you may see at least leave you with a working PC, and you can take steps to fix them. Blue screens, on the other hand, often don't allow this, leaving you with a system that just can't be used, at least normally.

Blue screen errors will often appear when there are more serious issues, usually related to the OS, drivers, or even hardware issues. These issues can be major, and not easily fixed. However, although the issues can be problematic, they're often still fixable, you just need to know how to bypass the error. Luckily, the error code you're getting relates to software, specifically the Windows Boot Manager. It's not a hardware issue, and can be fixed.

For this, and many other issues, you'll need to make use of Windows' repair options, which are found on the install disc. These can be booted into, and can then be used to fix such problems. To access

these you'll need to boot from the disc and select the repair option. Follow the prompts and let the recovery tools do their job.

With luck, this should repair any issues you are having, and you'll be able to boot into Windows as normal. However, if this isn't the case, you may need to use a System Restore point to revet your PC back to an earlier, working state.

This is commonly needed if the blue screen error is down to driver issues. Doing this will revert the drivers to an earlier version, hopefully one that works as intended.

If you have a previous working system image backed up somewhere, you can also use this option. You will, however, need to be aware than any changes you made to your system after this image was created will be lost.

If none of these tactics work for you, you may simply need to bite the bullet and either format and reinstall Windows manually – or use your system's factory reset, which can be done by using a supplied recovery disc, or via a BIOS restore option. Consult your documentation for this information on how to proceed with this.

In closing, I should note that some blue screen errors are related to physical hardware issues rather than operating systems or other software. These can be simple problems, such as RAM that needs reseating, or some sort of loose connection, but they can also be the result of actual hardware malfunction or damage. If this is the case, no software intervention will help, and you'll need to repair, or replace the damaged hardware.

⌃ **The boot menu on your Windows disc can help rescue your PC if you're suffering from blue screen errors**

⌃ **Blue screen errors can be worrying, but they can usually be fixed**

Uno, DOS...

I've purchased a big box of older PC software from a local car boot sale, and as far as I can tell, it requires the use of the DOS prompt in order to run. However, when I try to do so, it doesn't work. Often, nothing happens, and the software won't run, and I'm following the instructions. DOS says it doesn't recognise the commands, or mentions something about 16-bit programs not being supported.

Most of the software is older games, and there are some apps, but I can't get any of it to run. I don't really know what I'm doing wrong, as I said, I'm typing in commands exactly as stated in the software. Can you help?

Rob

I think the confusion here lies with the definition of DOS. DOS, or Disk Operating System, is an older OS that used to run alongside Windows, the graphical OS. DOS was a text-only system, and was used to run a lot of software back in the day, even when Windows was available. The two were different animals that co-existed on the same system.

PCs with modern installation of Windows no longer have DOS installed. Instead they have a command prompt. This is often referred to incorrectly as DOS. The command prompt is not the DOS operating system. It's simply a text-based command prompt used to execute various functions that are part of Windows. There's no capability to run actual DOS programs.

This is why you're not able to run the older programs, and why the system is telling you it doesn't understand the commands you're typing. It just doesn't have the actual software to handle it.
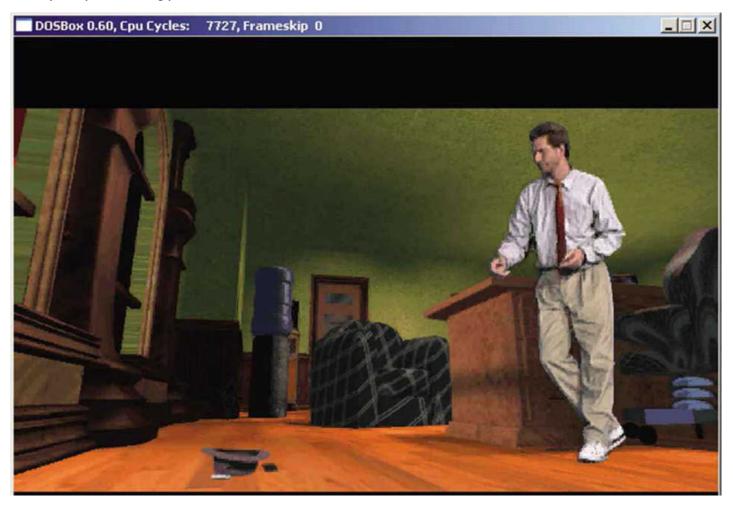
To run the old DOS applications you have various options. First, you could use a PC that has an actual copy of DOS installed. This isn't all that easy, of course, and may require more money, not to mention older hardware, as DOS may not work correctly with new equipment. It's not the most reasonable solution, unless you already have some spare, older kit lying around. If you do, this is probably your best solution, and will let you run the software as originally intended.

For most, the best option lies with software-based emulation. A very popular choice here, which is arguably the best around, is DOSBox (**www.dosbox.com**). This is a DOS emulator that can be used to run older software on new versions of Windows. It was once quite difficult to use for the layman, but newer versions of the emulator are far easier to understand. Full documentation is provided on the website, and it's totally free, so won't cost you any more cash. I'd recommend this option for the majority of users.

An alternative method involves virtual machines. If you have an actual copy of DOS (and likely, a floppy drive), you'll be able to create a virtual system within Windows that's running DOS. This will function as an actual PC with DOS installed, and isn't emulated in the same way as software. You can use tools like VirtualBox for this (**www.virtualbox.org**), and this is also free.

I'd say the visualisation route is a little overkill, though, and just for the sake of running old games, the DOSBox route is more suitable, and less time consuming to set up.

▼ **DOSBox can be used to run old, DOS-based software on new PCs**

Jason

Bare Essentials

What's your opinion on cheap laptops? I spend many weekends in my static caravan on the coast, and I could do with something to keep there for emails, the web, Facebook, writing letters, and the like. I've got a tablet, but for 'real' work I prefer a bigger screen and a proper keyboard. I'm almost ready to click the buy button on the Lenovo Essential B50-10, detailed below.

- **CPU:** Pentium N3540 (2.16GHz, quad-core)
- **RAM:** 4GB DDR3
- **Display:** 15.6" (1366 × 768)
- **Graphics:** Intel HD Graphics (4 EUs)
- **SSD:** 128GB
- **Optical:** 8×/24× DVD/CD rewriter
- **OS:** Windows 10 (64-bit)

I can buy this for under £220, which looks good to me. It's got all the things I need: webcam with mic., Wi-Fi 'n', Bluetooth, USB 3.0, HDMI, optical drive, and so on. The only thing I'm hesitating over is the CPU. I've been advised that the Pentium N3540 is effectively a phone/tablet job and extremely weedy. Is this the case?

Frank, East Riding of Yorkshire

Well, the N-series Pentiums (Bay Trail-M) are part of the same family as the Z3-series Atoms (Bay Trail-T), and those are indeed phone/tablet chips. Compared to current desktop offerings, yes, they're weedy. But the performance of modern hardware far outstrips the requirements of mainstream software – that's been true for some years. This is why many people are happily bumbling along with Core 2 Duo systems

a decade old. The big guns only need to be rolled out for high-end stuff.

For your sort of usage, Frank, the Pentium N3540 should be fine (I'd probably avoid the dual-core J-series Celerons, however). It's basically a higher-clocked version of the Atom Z3735F (1.33GHz), popular in Windows tablets (the Linx 7, 8, and 10, for example). Such tablets run surprisingly well, often with just 1GB of RAM. Your Lenovo will be significantly faster, especially with 4GB of RAM and an SSD.

Take a look at the chart I've printed. It compares the Pentium N3540 to the Core 2 Duo E6600 (2.4GHz, dual-core) and Athlon II X2 250 (3GHz, dual-core). Not too shabby, eh? Single-threaded performance isn't too hot, but most programs today are at least dual-threaded. I think you're safe to press that buy button. Bear in mind, though, that the B50-10 comes in several configurations, one with a 500GB HDD. This will perform slower than the SSD variant, but clearly you'd get more storage. Buy the model that best suits your needs.

▼ *Are Intel's ultra-mobile CPUs actually any good? [Benchmarks courtesy of www.passmark.com]*

	Intel Pentium N3530 @ 2.16GHz	AMD Athlon II X2 250	Intel Core2 Duo E6600 @ 2.40GHz
Price	Search Online	$66.05 BUY NOW!	$79.99¹
Socket Type	FCBGA1170	AM3	PLGA775
CPU Class	Laptop	Desktop	Desktop
Clockspeed	2.2 GHz	3.0 GHz	2.4 GHz
Turbo Speed	Up to 2.6 GHz	Not Supported	Not Supported
# of Physical Cores	4	2	2
Max TDP	7.5W	65W	65W
First Seen on Chart	Q2 2014	Q2 2009	Q4 2006
# of Samples	124	362	1022
Single Thread Rating	846	1011	916
CPU Mark	1930	1765	1562

Ram Jam?

My gaming PC currently has 8GB of RAM. Would I benefit from upgrading to 16GB? The PC is based around a Core i5-4670K, GeForce GTX 970, and 1080p monitor. I don't have any complaints, but I can't help thinking I might be missing out.

N. Wallace, Gmail

I wasn't sure about this myself (though I had my suspicions), so I've looked into it. You'll probably find this TechSpot article pretty illuminating: http://goo.gl/UY8oE0. Here, a high-end Skylake gaming rig was run with 4GB, 8GB, and then 16GB. Out of twenty games, just three pushed RAM usage above 8GB, and even when only 8GB was fitted, the performance drop was non-existent. Indeed, there was only a minor hit when a mere 4GB was fitted. It seems 8GB is usually enough even for applications such as Blender and Adobe Premier, though 4GB clearly isn't.

Now, if you've got tons of programs open in the background (why would you when you're

gaming?), that's going to have an impact. Mods and plug-ins for games are likely to increase RAM usage too. However, it's plain that off-the-shelf games don't need 16GB. 8GB is ample. Over time, that's going to change – maybe when 4K gaming really takes off (though texture data is stored in graphics RAM, not system RAM). But for now, I reckon you should stick with what you've got, my friend. Don't waste your money.

▼ *Can you ever have enough RAM?*
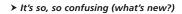
Generation Game (#1)

I'll soon be building a Core i7 gaming PC, and the motherboard I've settled on is the Gigabyte GA-Z170-Gaming K3-EU (LGA 1151). This seems good value at about £100, as it's got a Killer Gigabit LAN port and a PCIe 3.0 ×4 M.2 SSD slot (NVMe) and supports USB 3.1. At least, Gigabyte *claims* it supports USB 3.1. However, all the USB ports on the backpanel are the traditional, Standard-A variety. Surely USB 3.1 ports need to be the new, reversible, Type-C variety?

Louis, Gmail

The Type-C connector is independent of USB 3.1. For instance, USB 2.0 ports can use it, quite within the rules laid down by the USB-IF (www.usb.org). As you've found, Louis, many motherboards with USB 3.1 ports choose to adopt the Standard-A connector, which is also allowed. Your chosen Gigabyte is fine.

*Or is it? You see, USB 3.1 comes in two flavours. USB 3.1 Gen 1 – SuperSpeed – is just the new name for USB 3.0. The bandwidth is therefore 5Gbps. Only USB 3.1 Gen 2 – SuperSpeed+ – offers the new 10Gbps. Sadly, many motherboard makers don't specify what's being sold. Regarding the GA-Z170-Gaming K3-EU, Gigabyte mentions that the USB 3.1 *standard* delivers 10Gbps (and tempers this by saying it's 'theoretical'), but it doesn't mention what the *board* delivers. I believe the USB 3.1 controller is ASMedia's ASM114, so the query below might shine further light on the matter...*

➤ **It's so, so confusing (what's new?)**

Generation Game (#2)

The following query (courtesy of a business colleague) is best read in conjunction with the one above...

I'd like to upgrade to USB 3.1 (10Gbps). The PCIe slots on my motherboard, though, are only second-generation, not third-generation. Would a USB 3.1 add-on card be able to run at full speed, or would I see no improvement over USB 3.0 (which the board already supports)?

Justin, Derbyshire
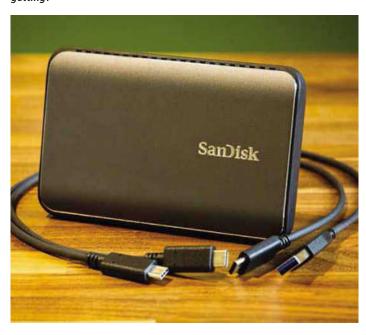
PCIe 2.x is easily up to the task, but all USB 3.1 cards are ×4 affairs. Do you have a suitable spare slot? 10Gbps equals 1.25GB/s (simply divide by eight), and PCIe 2.x provides 500MB/s per lane. A ×3 card would do it, but of course there's no such thing. For PCIe 3.x, there's nearly 1GB/s per lane, so a ×2 card would be sufficient. Again, no such thing exists. Cards and slots can only be ×1, ×4, ×8 (rare), or ×16 (×32 cards and slots are possible, yet I've seen neither), but thankfully smaller cards will always work in bigger slots.

*So far, so simple. But it's never *that* simple, is it? The controller on nearly all USB 3.1 cards, and most USB 3.1 motherboards, is ASMedia's ASM1142. This can be wired up as either PCIe 2.x ×2 or PCIe 3.x ×1. Clearly, then, the maximum bandwidth is at best 1GB/s – that is, 8Gbps, not 10Gbps. Hmm.*

In short, Justin, make sure you buy a PCIe 2.x card. A PCIe 3.x card would work in your PC but only at PCIe 2.x speeds, and as it'd deploy only a single lane (despite being a ×4 card), the bandwidth would be just 500MB/s – 4Gbps. That's not even fast enough to be classified as USB 3.1 Gen 1 (aka USB 3.0). Sadly, few motherboards or add-on cards can deliver the proper 10Gbps (they need Intel's expensive Thunderbolt 3 controller to do it). 8Gbps is still damned fast, of course, but just remember that when card and board makers advertise SuperSpeed+ and 10Gbps, they're usually lying.

Note – Remember, too, that bandwidth is shared across all devices. In the case of the ASMedia ASM1142, if you used two devices simultaneously, the bandwidth to each port would be halved to 500MB/s or 4Gbps (conversely, Intel's Thunderbolt 3, running over PCIe 3.x ×4, has a monster 32Gbps to share out). To be fair, this would only be a problem if you were running two or more USB 3.1 Gen 2 SSDs – nothing else could build up enough steam.

▼ **USB 3.1 is great and all, but are you getting what you think you're getting?**

Crowdfunding Corner

Want to expand the storage on your phone? There are plenty of ways to do that, but this week's Kickstarter projects give you additional features you can't get anywhere else either

KuPower

Phone batteries are tricky to manage. The more you charge them, the more you erode their performance and longevity, but if you don't charge them enough then your phone might die the moment you need it. KuPower's selling point is that as well as an expandable memory card slot and battery pack, it comes with software that helps you analyse your battery's performance so you can keep it at its optimum performance level rather than overcharged and overheated.

The 'intelligent maintenance' mode of which we speak uses the information it collects to manage battery performance and charging to try and extend your unit's lifespan. You can access the extended storage even while the device is charging, and it has no effect on the mobile signal.

An iPhone 6S, we're told, will get 25 hours more talking time from the pack. A Galaxy S6 will get 33 hours more talking time, so it's not an insignificant amount of power.

If you want one, it costs $39 (£28) for a single unit with a 16GB MicroSD card, or $49 (£35) for a unit with a 32GB MicroSD card. The hardware ships in July 2016, so it shouldn't be a long or frustrating wait.

URL: kck.st/1WeJji5
Funding Ends: Thursday, May 12th 2016

Dash-i MicroSD Reader

If you'd prefer a smaller external storage device (and own an iPhone/iPad – sorry Android and Windows users) then the Dash-i might be a better option. This super-compact device allows you to add MicroSD storage to any iOS device with a lightning port, from the iPad Pro to the iPod Touch.

The good thing about this card reader, aside from its small size, is that it also comes as a slightly larger model – the Dash-i plus – which contains a pass-through lightning port so that you can power and charge your device without losing access to your storage. The port is spring-loaded for easy insertion and removal of the card, and the 3mm neck on the port means it should work even if you've got a case on your device.

If you hurry you might be able to pick up a Dash-I for $25 (£18) but in an unusual promotion you can get a free upgrade to the Dash-i Plus by sharing the campaign on social media. Though if you'd rather just pledge for it outright, a Dash-i Plus costs $30 (£25). The hardware is due to ship in June 2016 and the creators have good form in bringing products to completion through Kickstarter, which should boost your confidence. The project has already passed its funding goal so from this point on you can virtually treat it as a pre-order – though with the usual Kickstarter caveats!

URL: kck.st/1S4MIQG
Funding Ends: Wednesday, May 4th 2016

Dash-i Plus

Dash-i

Disclaimer: Images shown may be prototypes and Micro Mart does not formally endorse or guarantee any of the projects listed. Back them at your own risk!

App Of The Week

E-reader Apps

Fancy a bit of e-book reading but don't know where to start?

Although, in my opinion, nothing can ever really replace the look, feel and smell of a book (of the paper variety), the e-book has become increasingly popular. They're not all that bad, especially if you have a few books on the go and you decide to do a spot of reading on the beach, or in a field under a tree on a summer's day.

The e-book reader has enabled bibliophiles to carry a single, almost paper thin, device around with them, with access to a wealth of material. But as with many electronic devices, there are lots of different versions available, and the choice can become overwhelming at times.

This week, we thought we'd have a quick look at a few of the top e-reader apps we've been using regularly, for a number of devices and platforms.

Google Play Books
Google Books started life in late 2004 and has grown to become one of the biggest online book stores and e-readers in the digital world.

There's plenty of material available, some free like Treasure Island, The Three Musketeers and Alice's Adventures in Wonderland, and countless thousands more both modern and classic that

require payment – the choice, of course, is yours.

Being a Google project, all you need is a Google account, which is free, then just point the browser of the device to **books. google.co.uk**, and search for a book. Once you find the one you want, click on the 'Read Now' link, and you'll able to start reading within the browser.

Although it's not perfect to read within a browser, you do get a few options and settings that will attempt to make the material a little easier on the eyes. And, you don't need a separate e-book device either, just a netbook, tablet or laptop. The e-book can be downloaded to read at a later date, as PDF or ePUB, and it's easy to use.

Calibre
Calibre is an open-source e-reader for Windows, Mac and Linux, developed for e-book readers by e-book readers.

It's a complete e-book management program that will organise, download, transfer and allow you to actually read the material that you currently own. It can handle pretty much every DRM-free e-book file type in the known universe. It can also synchronise your e-books

with other e-reader devices, download news reports and casts, and can it even supports the CBR comic book type.

Calibre is a great one-stop program that is certainly worth a try.

Kindle
Many of you would rather avoid the Amazon approach, but you have to admit that the Kindle software is a bit too big to ignore.

Amazon Kindle is available free for almost every platform going; its features are many and it's getting bigger and bigger by the day. You can sync your page locations across all your devices, highlight and take notes, look words up in the built-in dictionary, look up facts related to the text in the book and personalise it extensively.

Yes, there's loads that Kindle can do. If you're not averse to going down the Amazon route, then you won't go far wrong with the Kindle software.

Features At A Glance
Each of these readers:
- Are free.
- Support different file types (except for Google).
- Are cross platform.
- Are easy to use.

⌃ *Google Books may end up dominating the e-book world*

⌃ *Calibre is a more open and friendly approach to e-reading*

⌃ *Amazon Kindle: there's little else to say really*

Logging Off

As regular readers of Micro Mart will be aware, I'm a keen player of *World of Tanks*. There isn't much I enjoy more than to hear the crackle of high explosive anti-tank rounds hitting armoured plating before punching through. I've spent enough time playing now to have developed my own skills and tactics for overcoming enemy vehicles in a variety of scenarios. However, some games don't go to plan for inexplicable reasons – like all your shots bounce and all of

theirs hit, which usually ends with someone declaring that 'cheating' is occurring.

Having myself been accused of cheating on a few occasions (and I certainly wasn't), up till now I've taken these assertions with a pinch of salt. Yes, some of the mods that some people are loading up do give them some minor advantages, but surely nothing that can turn a poor player into a tracked demi-god?

And then I saw a video that Will Frampton (AKA QuickyBaby) posted, where someone really was cheating quite outrageously.

Probably the toughest shot to pull off in the game is one where a tank at range is moving at 90 degrees to you, because depending how fast the tank is moving and some light tanks are quick, you need to lead the target. Getting it right will enable the shell to arrive at the point where the tank will be, not where it is when you fire. That might sound almost impossible, but for a skilled player it's an achievable if not always successful skill. However, in the video I've seen, the player is using a mod that does the calculation for him, allowing ridiculously accurate shooting with a tank that doesn't even have a turret!

What's really bizarre about this video is that it was presented as a demonstration of the player's skill, as he eliminates 14 of the 15 opposing tanks. Instead it shows the use of a mod that would probably get the player banned and their account frozen if Wargaming.net became aware. Will concludes and I'm with him on this, that the player probably doesn't understand that what he's doing is wrong, as you can use some mods entirely legitimately.

And for that reason he's decided not to get him banned,

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however tempting that thought might be. However I'm less keen on the idea of not taking any action against him, because otherwise he'll just keep on cheating and eventually everyone will, ultimately ruining the game.

Even if that doesn't happen, he's defrauding those playing against him and the cheat massively devalues the efforts of those who can make these shots using pure ability and not an aim-bot.

What is it with some people? They seem to gravitate towards people enjoying themselves with the primary objective of stopping that for their own nefarious reasons.

World of Tanks isn't the only multiplayer online game with this problem; they all seem to suffer to some extent. If it's not finding out that the teammate you're relying on is actually a badly coded bot, then you discover indestructible foes or ones that magically slow you down when you're in their vicinity.

I hope wargaming.net acts fast on this phenomena, because cheating substantiates the view that good players aren't naturally skilled, when some certainly are.

Mark Pickavance

LAST WEEK'S CROSSWORD

Across: 7 Lexicological, **8** Spread, **9** Upsell, **10** Content, **12** Bombe, **14** Fence, **16** Metonym, **19** Dismay, **20** Remake, **22** Neil Armstrong.
Down: 1 Help, **2** Bisect, **3** Bonding, **4** Focus, **5** Fiasco, **6** Vault Boy, **11** One-Liner, **13** Refresh, **15** Comply, **17** Ormers, **18** Cymru, **21** Kane.

THIS WEEK'S CROSSWORD

Across

7 American composer and mathematician (1916-2011). His compositions developed from the 12-note system of Schoenberg and Webern. (6,7)
8 The sale of goods to the public in relatively small quantities for use or consumption. (6)
9 In mathematical writing, this adjective is used to modify technical terms that have multiple meanings. (6)
10 Obscure the light from or to another celestial body. (7)
12 A person who is regarded as underhanded, furtive and contemptible. (5)
14 A cross-platform web desktop developed by TransMedia Corporation. (5)
16 The card game blackjack or vingt-et-un. (7)
19 In electronics, a short length of conductor used to close a break in, open or bypass part of an electrical circuit. (6)
20 Sharp-pointed awl for marking wood or metal to be cut. (6)
22 Relating to the branch of knowledge that deals with the occult significance of numbers. (13)

Down

1 A metal conductor that carries electricity over a distance. (4)
2 The world's first 3D-printed electric car. (6)
3 Someone who is skilled at interpreting data. (7)
4 A brief or temporary failure of concentration, memory or judgement. (5)
5 A satellite of Uranus, the furthest from the planet, which has a heavily cratered surface and was discovered by W Herschel in 1787. (6)
6 Musical passage where notes are to be played in an abruptly disconnected manner. (8)
11 The mathematical study of change. (8)
13 A small area with a relatively high temperature in comparison to its surroundings. (7)
15 Double-sided printing or scanning. (6)
17 A ring-shaped surface generated by rotating a circle around an axis that does not intersect the circle. (6)
18 A mark to indicate a direction or relation. (5)
21 A partiality that prevents objective consideration of an issue or situation. (4)

In Next Week's Micro Mart*

- **PC building special. Choosing the right components, reusing old parts and more!**

- **The best free alternatives to paid software**

- **Essential advice for data recovery**

- **How technology can help you sleep**

- **Plus the usual mix of news, features, reviews and advice**

micro mart

PCs And Stuff

(including cats)

* May be subject to change